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THE IRON AGE

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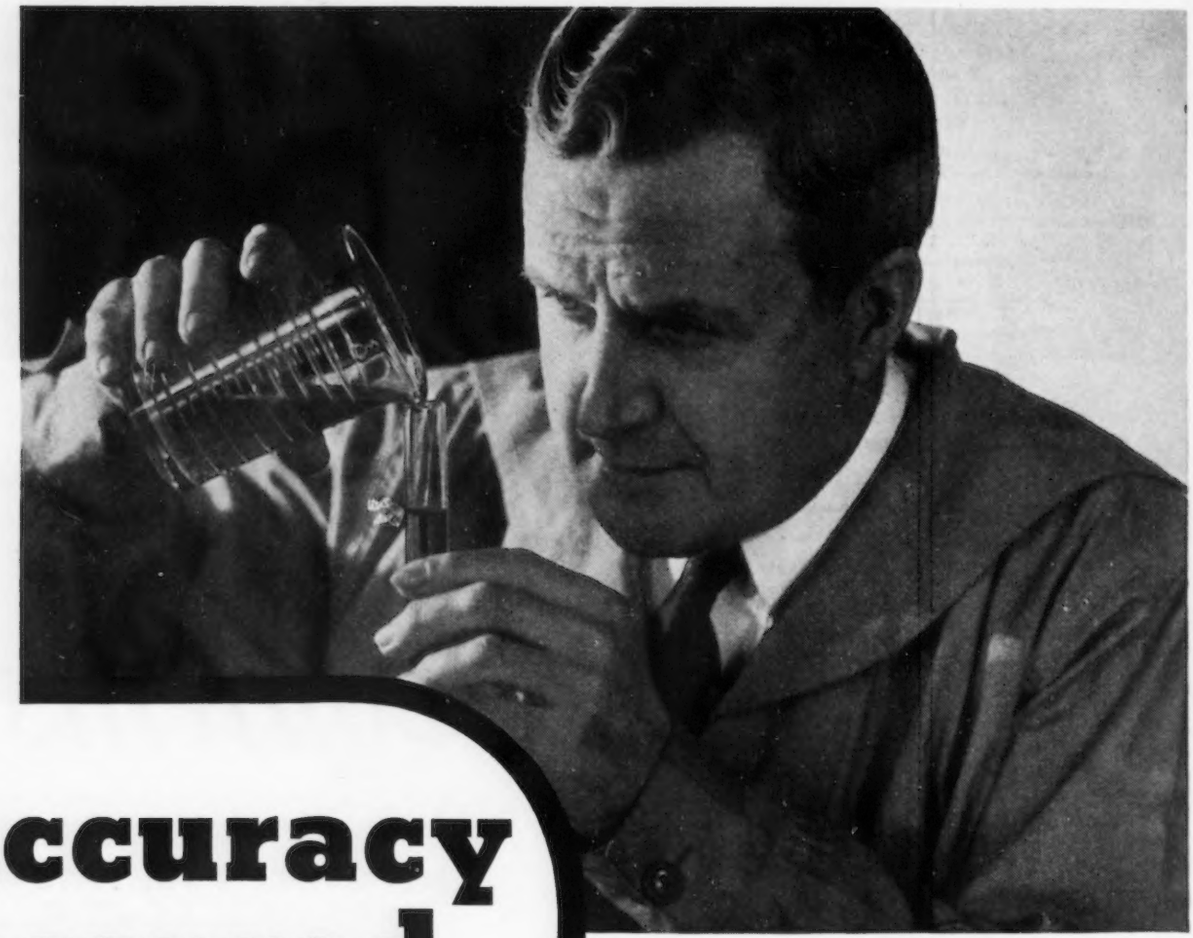

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STEEL CORPORATION A-L **PITTSBURGH, PA.**
Steels of Today and Tomorrow

... THE IRON AGE ...

DECEMBER 29, 1938

ESTABLISHED 1855 Vol. 142, No. 26

Wishing You A Happy and Prosperous New Year

THERE are two old sayings that come to mind in thinking about wishes. One is "If wishes were horses, then beggars could ride." The other is "If you wish for anything hard enough, your wish will come true."

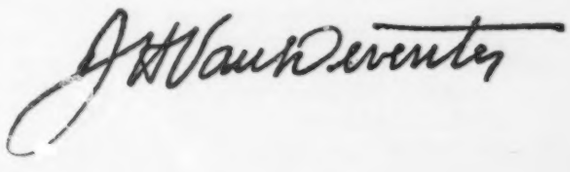
These sayings seem to contradict each other, but actually they do not. It is true that you cannot get a horse or anything else just by wishing for it. But it is also true that if you wish hard enough for something so that it compels you to put forth diligent effort toward getting it, the chances are that you will get your horse or your motor car, or your promotion, or your profit on doing business or whatever it is that you wish for to the point of "willing" it.

A wish in its rough state is like a soft and unhardened piece of tool steel that will upset or bend when you try to cut with it. But subject it to the hot flame of will and the quench bath of work and it becomes a keen edged tool that is willing and able to turn the toughest material into a finished reality.

Now in wishing our readers and ourselves a Happy and Prosperous 1939, we are not stopping just at the wish, but you and we are going to work together to obtain the reality.

For the past five years, you and we have wished together and worked together to the end that America might be spared from the blight of the defeatism which has muzzled enterprise and discouraged initiative and abolished freedom in so many countries of the world. We are going to continue to wish, to will and to work together for this during 1939 and more confidently and courageously than ever in the light of the marked progress made toward that end in 1938.

This year we are going to work together shoulder to shoulder to make American industry safe for democracy in the one way it can be made safe, namely by restoring its vanished profit margins, for no nation can survive and no people can prosper and progress unless the sustaining lifeblood of profit courses through the veins of its industry and its business.



Perchloric Acid

Part II

o o o

By C. MORRIS JOHNSON
Chief Chemist, Crucible Steel Co. of America, Park Works

o o o

THIS article continues the detailed description of a new perchloric acid procedure for the determination of manganese in all alloy steels without separation of chromium, the first part of which appeared in the Oct. 13 issue. The author herein first describes manganese determinations in steels containing Cr, Si, Ni, and Cu in any one or more combinations, and in high-chromium steel. He then discusses the effect of molybdenum, vanadium, cobalt, etc., in steels being tested for Mn content.

FOR a manganese determination in high-chromium-silicon-nickel-copper steel (such as 9, 2, 20, 1, with, say, 0.10C), it should be noted that some of the alloy combinations of the four elements are slow to dissolve, or become partially immune and retain metallic luster on heating, even with 1:1 $HClO_4$. The problem then becomes merely a matter of first heating such steels with 10 ml. of 1:1 HCl until the metal is decomposed. The excess of HCl is then boiled off to a thick syrupy liquid, with the cover glass remaining on the dissolving flask.

The next step is to introduce 6 ml. of 60 per cent $HClO_4$ and take the mixture to heavy fumes of $HClO_4$. On fuming for one minute with a dense cloud of the $HClO_4$ coming from the flask, and then cooling, the underside of the cover glass should show red crystals. The solution is cooled and the analysis finished as described for the persulphate-silver nitrate oxidization. (Oct. 13 issue.) The result shown by the $AgNO_3$ method is 0.725 per cent Mn, whereas 0.74 per cent Mn is shown by the ZnO-PbO_2 method (old standard method).

$HClO_4$-PbO_2 Method

The old standard method (ZnO-PbO_2) involved a precipitation of a chromium and iron away from the Mn, filtering off, and then taking a definite proportion of filtrate. The first improvement tried was the $HClO_4$-PbO_2 method. As a result of some hundreds of tests, the following conditions were found to be essential for the $HClO_4PbO_2$ method of manganese determination:

(1) All chloric acid odors must be eliminated.

(2) If the perchloric acid used per test exceeds a certain amount, low and conflicting results are obtained, these being most likely due to some of the manganese reverting to insoluble basic oxide which is filtered off with the excess PbO_2 and chromates of lead.

(3) All chromium must be converted to chromate by heavy fuming with $HClO_4$ for at least one minute, and until red crystals show on the cover glass on cooling.

(4) The PbO_2 and chromate of lead must be washed with a perchloric wash, or chromates will run through as a muddy decomposition product.

(5) Both the standard steels and the samples being analyzed should contain approximately (within one or two per cent) the same amount of chromium. The chromium can easily be adjusted in the standard steels by adding dichromate ($K_2Cr_2O_7$) to the low-chromium or the plain carbon steel standards, thereby making them suitable for comparison with high chromium steel samples. The foregoing notes also apply to the final method developed, that is the $AgNO_3$-$(NH_4)_2S_2O_8$-$HClO_4$ method, with the exception of note No. 4.

Details of PbO_2-$HClO_4$ Method

First weigh 0.100 gm. of drillings into an 125 ml. flat bottom pyrex flask having a lip, and then add 10 ml. of 1:1 HCl. This is heated slowly while the cover is on and until the metal is decomposed, after which boil down very slowly to a syrupy liquid, but no lower. The cover and side walls of the flask are then rinsed down. Add 6 ml. of 60 per cent $HClO_4$ C.P. Then boil down with the cover on until all chromium is converted to red chromate, after which heat at boiling for one minute longer by the clock, during which time heavy white fumes pour out from under the cover of flask. If a number of tests, say 25 or more, are being run together, bring them all to slight fumes, then lower the heat under all but three tests. These three are then fumed as described and removed from the heat. The stove shown in Fig. 1 permits 42 tests to be dissolved at one time. Three tests are then fumed heavily for one minute and removed and treated as described.

The red crystals are again rinsed from the cover glass and side walls of the flasks, 10 ml. H_2O is added to all tests after which they are all brought to boil, and boiled with the cover off for three minutes to remove all chloric odors. Now add 2 ml. only, and no more, of 1:1 $HClO_4$ and boil for four minutes, remove from the heater and add 1 gm. of specially prepared PbO_2 of a brown shade.[1]

Boil for three minutes and cool, after which filter with suction through washed ignited asbestos that has previously been heated with $KMnO_4$ (5 per cent solution) and then washed with H_2O. Wash this residue, which consists of the insoluble chromates and spent PbO_2, ten times with 5 ml. of 60 per cent C.P. $HClO_4$ diluted to 500 ml. with H_2O.

After every other filtering, scrape off the layer of PbO_2, etc., down to the asbestos, or otherwise the filtering and washing will be slow. Or also, if scraping is omitted, this PbO_2, etc., has a decided tendency to retain a pink color and will have to be washed about 20 to 30 times to remove all permanganate. A properly prepared plug will last for as many as 40 to 50 tests.

Titrate the pink filtrate and washings to a colorless liquid with a sodium arsenite standard. This is standardized with plain steel of about the same manganese content, to which potassium dichromate is added at the start to bring the chromium content to about that of the samples. Refer to the description of manganese in 18-4-1 high speed steels in the Oct. 13 issue of THE IRON AGE. Consult also Table I which demonstrates the effect of chromium on the manganese percentage factor of the arsenite standard solution. The arsenite titrations should be made as soon as possible after the tests are cold and filtered from the lead salts.

The suction flask is heavy glass of 260 ml. capacity, 14.5 cm. tall, with a side outlet tube, and takes a No. 7 stopper, being of standard size. The 125 ml. pyrex cone dissolving flask with lip is strictly flat bottomed, having straight side walls. Fig. 2 shows the improved type of stainless steel ventilating hood used for all these experiments.

Solutions Used in Foregoing

Silver nitrate = 3 gm. per 1 litre of H_2O.

Ammonium persulphate = 240 gm. per 1 litre of H_2O.

Sodium arsenite = 1 gm. per 3600 ml. of H_2O.

[1] "Chemical analysis of Special Steels", by C. Morris Johnson, 4th edition, pp. 577 to 602.

One gram of sodium arsenite in 3600 ml. of H_2O is equivalent per ml. to about 0.072 per cent manganese when 0.100 gm. is taken for analysis for plain steel, and about 0.079 per cent for chromium steels above 4.00 per cent chromium.

This description of the $HClO_4$-PbO_2 method is given for three reasons:

(1) Some who do not have so many manganese determinations may prefer to titrate to the disappearance of the real permanganic pink shade obtained in this first method, even though it involves one filtration.

(2) The chemistry of the PbO_2 method is interesting.

(3) It was the development of this first method that pointed the way to the use of the $HClO_4$-$AgNO_3$-$(NH_4)_2S_2O_8$ oxidation in the presence of any amount of chromium or tungsten, avoiding ZnO or $NaHCO_3$ separation of chromium, or any filtrations. The final procedure developed is the same to the point of substituting the $AgNO_3$-$(NH_4)_2S_2O_8$ for the PbO_2. At the Park Plant it was found that the PbO_2-$HClO_4$ procedure was a great boon until the substitution of the $AgNO_3$-$(NH_4)_2S_2O_8$ method was thought of and tried in order to eliminate filtration by first converting all chromium into chromates by fuming $HClO_4$.

Manganese in High-Chromium Steel

The laboratory procedure for the new silver nitrate-ammonium persulphate—perchloric acid method for determining manganese in high-chromium steels, with Mn ranging from about 0.10 to 1.50 per cent, is as follows: Dissolve 100 mgs. of the sample in 12 ml. of 1:1 $HClO_4$ in a 125-ml., straight wall, flat bottom, pyrex cone flask with lip and cover glass. Boil down to heavy fumes, and fume heavily at boiling for at least one minute. The solution will be red, and the drop on the lid must be red and contain red crystals on cooling. For all experiments to date, unless this heavy fuming is done the results do not check.

Cool the solution carefully, rinse off the liquid film and red crystals from the cover glass and beaker walls, and add 10 ml. of H_2O and boil for three minutes without the cover, in order to remove all ClO_3 smell.

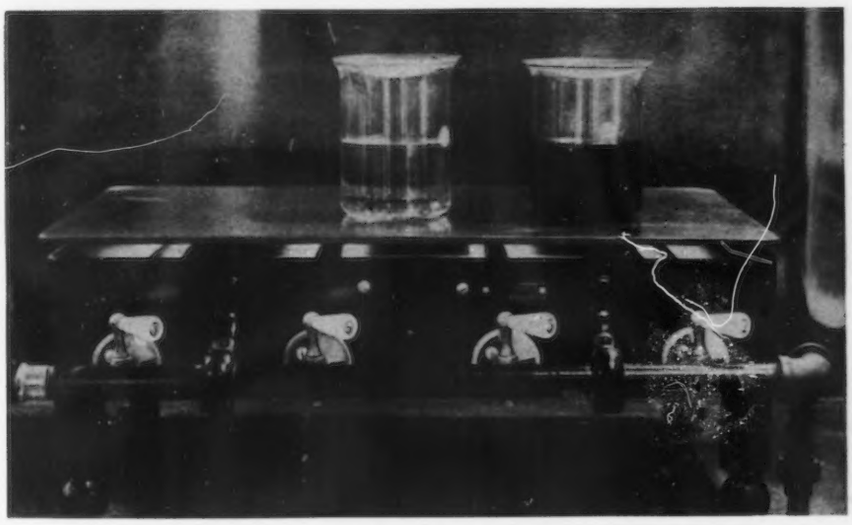


FIG. 1—Type of stove, such as that used for "hot dogs" which is invaluable in the carrying out of numerous analyses with perchloric acid.

After cooling add 10 ml. of $AgNO_3$ and 15 ml. of $(NH_4)_2S_2O_8$. Boil for three minutes, and then cool in a trough of running water to about 60 deg. F. Titrate with the arsenite standard to disappearance of the *brown* tints, getting a yellow end point. Use foil No. 55a or similar foil, to which equivalent dichromate has been added at the start. Standardize the sodium arsenite by putting through the entire method a plain steel standard, to which dichromate has been added in order to bring the chromium content to about the same as that of the test specimen. Or, a standard steel alloyed with a chromium and manganese content about like that of the test sample can be used. Any titration solution can be retitrated by reboiling with 5 ml. of persulphate, then cooling and retitrating. In some cases it is advantageous to reboil the steels for nine minutes, as, for example, reboiling usually corrects disagreements of 0.02 to 0.04 per cent.

Mn From 3 to 14

The new perchloric $AgNO_3$ — $HClO_4$ method for high chromium-

silicon-nickel-copper steels, in which the manganese ranges from 3 to 14 per cent, is as follows:

A smaller amount of this type of steel is weighed on a delicate balance which has a sensitivity of ten divisions for each 1 mg. For a 4.0 per cent manganese and 12.0 per cent chromium, high carbon steel, weigh 25 and 30 mgs. of sample, and proceed exactly the same as in the 0.10 to 1.50 per cent range of Mn, except that the persulphate is increased to 30 ml. Suitable standard mixtures are taken in order to get the manganese value of the arsenite solution for this manganese range, or else a similar steel containing approximately the same manganese and chromium contents will answer for standardizing.

By the foregoing method, the following results were obtained: using 50 mgs. of U. S. Bureau standard No. 100, containing 1.39 Mn, to which 50 mgs. $K_2Cr_2O_7$ and 50 mgs. of standard No. 55a were added, an arsenite factor of 1 ml. equals 0.069 per cent Mn was obtained, and on using 70 mgs. of the No. 100 standard and adding 50 mgs. $K_2Cr_2O_7$ + 30 mgs. of standard No. 55a, a factor of 0.0667 was obtained, showing that the procedure gives agreeing factors. In an actual test for Mn content, a heat containing 3.52 per cent Mn was found by the test to show an average of 3.53 per cent Mn on two tests. Furthermore, when this heat was reboiled with 10 ml. persulphate, the Mn content again showed an average of 3.53 per cent on two tests.

To show the precision of the test with high Mn steels, consider that in one heat containing 12.15 per cent Mn, the test showed 13.33 per cent Mn, and in reboiling showed 12.17 Mn. The factor for this test was secured from a 14 per cent Mn standard.

It is interesting to point out another way of standardizing. C. P. $KMnO_4$ crystals can be weighed, on a balance sensitive to ten divisions for each milligram, into the cone flask, along with dichromate and No. 55a ingot iron. This mixture can then be dissolved as described for the steel and subjected to all of the treatments already given. The $KMnO_4$ contains 34.76 per cent manganese. For example: 25 mgs. of 14.0 per cent Mn steel would be equivalent to 25 x 0.14 = 3.5 mgs. Mn. Ten milligrams of $KMnO_4$ equals 10 x 0.3476 = 3.476 mgs. Mn.

The results shown by this procedure, in terms of per cent Mn on a 100 mgs. basis are as follow: 25 mgs. of 14 per cent Mn steel gave a factor of 0.077 per cent Mn; 30 mgs. of 14 per cent Mn steel gave a factor of 0.076 per cent Mn.

In a certain heat an analysis by the foregoing method of 25 mgs. gave a determination of 12.50 per cent Mn, and the 30-mgs. analysis gave a determination of 12.25 per cent Mn. On testing this same heat by persulphate precipitation and titration with ferrous ammonium sulphate[2] a Mn determination of 12.15 per cent was obtained.

On reboiling this same heat with 25 ml. of persulphate, the percentage factors were 0.077 per cent Mn and 0.076 Mn, and this new procedure gave a manganese determination of 12.23 per cent using the 25-mg. sample, and 12.23 per cent Mn using the 30 mg. sample.

[2] "Methods for Chemical Analysis of Special Steels," 4th edition, pp. 578 to 582.

TABLE I

Manganese Factor of the Arsenite Standard as Affected by the Presence of Chromium in the PbO_2-$HClO_4$ Oxidation

$K_2Cr_2O_7$ added to U. S. Bureau of Standards No. 20b = 0.673 per cent Mn	Arsenite Factor Per Cent Mn when 0.1 gm. is Taken for Analysis.
No. $K_2Cr_2O_7$ added	0.072 per cent Mn
4 mg. (1.41 per cent Cr)	0.070 per cent Mn
6 mg. (2.13 per Cr)	0.071 per cent Mn
9 mg. (equivalent to 3.18 per cent Cr)	0.072 per cent Mn
10 mg. (3.53 per cent Cr)	0.074 per cent Mn
11 mg. (3.89 per cent Cr)	0.075 per cent Mn
12 mg. (4.24 per cent Cr)	0.077 per cent Mn
13 mg. (4.59 per cent Cr)	0.081 per cent Mn
14 mg. (4.95 per cent Cr)	0.080 per cent Mn

Effect of Chromium on Manganese Per Cent Factor in Steels, When the Chromium is Alloyed with the Steel

U. S. Bureau Standards:	
No. 20b (no Cr, 0.637 Mn)	0.072 per cent Mn
No. 10d Bessemer (no Cr, 0.915 Mn)	0.074 per cent Mn
No. 100, rail standard (0.18 Cr, 1.39 Mn)	0.074 per cent Mn
No. 30 (0.977 Cr, 0.707 Mn)	0.070 per cent Mn
No. 106 (1.29 Cr, 0.484 Mn)	0.072 per cent Mn

Showing Effect of Mo and W and High Cr on Arsenite Factor

8.0 Mo, 4.0 Cr, 1.23 V, 1.7 W, 0.29 MN	0.079 per cent Mn
No. 73, (13.9 Cr)	0.080 per cent Mn
No. 101 (17.56 Cr, 9.44 Ni, 0.554 Mn)	0.079 per cent Mn
28.50 Cr, 0.44 Mn	0.080 per cent Mn

Effect of Mo

The following takes into account the effect of molybdenum with manganese at about 1.5 per cent. Steels containing 18 per cent Cr and 10 per cent Ni and 3 per cent Mo may require an initial heating of 50 mgs. with 10 ml. of 1:1 HCl until the steel is completely decomposed. Boil to syrup and then add 6 ml. of 60 per cent $HClO_4$ and then boil to heavy fumes and continue boiling in this manner for one minute.

The flask is removed from the heater, and the drop on the underside of the cover glass should show red crystals of dichromate on cooling. From here on the method already outlined is followed, taking care to fume heavily for one minute and oxidize to $HMnO_4$ with $AgNO_3$ — $(NH_4)_2S_2O_8$.

Rezistal stainless steels containing about 18 to 26 per cent Cr and 10 to 25 per cent Ni and 2 to 3 per cent Si may require the HCl treatment to prevent the drillings from becoming immune to the $HClO_4$. When immunity occurs part of the steel will remain undissolved in the bright metallic state.

The results shown by the above procedure are as follow: a standardizing mixture of 1.39 per cent Mn rail standard plus 50 mgs. dichromate gave a percentage factor of manganese on a 0.100 gm. basis per ml. of 0.071 for one test and 0.070 for a second test. For one heat of 3 per cent Mo steel, using a 50-mgs. sample, the $AgNO_3$ — $HClO_4$ method showed 1.65 per cent Mn on one test and 1.66 per cent Mn on another test, and a determination by the PbO_2+$HClO_4$ method showed 1.62 per cent Mn. For a different heat of 3 per cent Mo steel, the $AgNO_3$ — $HClO_4$ method showed 1.38 Mn on two successive tests, and the PbO_2 + $HClO_4$ test showed 1.37 per cent Mn.

Effect of Vanadium

The effect of the element vanadium under conditions of the method devel-

oped so far may be one of slight interference. This is taken into account by adding an equivalent amount of vanadium in the form of V_2O_5 or a vanadate. For example: 2 mgs. of V_2O_5 will be equivalent to about 1.12 per cent vanadium in 0.100 gram of sample.

The following shows the percentage per ml. on a 0.100 gm. basis for various plain steels with vanadium added:

U. S. Bureau standard No. 10d, 0.100 gm. of 0.915 per cent Mn plus 2 mgs. V_2O_5, gave 0.069. This same standard without V_2O_5 gave 0.065 as an arsenite factor.

No. 100, rail standard, 0.100 gm. of 1.39 per cent Mn plus 2 mgs. V_2O_5 gave 0.070. The same standard without V_2O_5 gave an arsenite factor of 0.067.

The above No. 10d standard reboiled with 10 ml. persulphate and with V_2O_5 gave 0.074; without V_2O_5 gave 0.070.

The above No. 100 standard reboiled with 10 ml. persulphate, with V_2O_5 gave 0.076; without V_2O_5 gave 0.074.

All the above shows that vanadium in the usual ranges has very little effect on the factor values.

Vanadium and Chromium

Concerning the effect of vanadium and chromium in the $AgNO_3$—persulphate—$HClO_4$ method, it should be pointed out that the presence of vanadium in with high chromium does not have an appreciable reaction effect on factor values but indications so far are that it causes slightly higher figures in some plain, low chromium combinations.

Effect of Cobalt

Other than a pink color of the cobalt (37 per cent Co) there is no interference by cobalt. This pink can easily be compensated for by preparing a foil containing all coloring elements such as chromium and cobalt in the same amounts, but with no manganese. The source of cobalt can be cobalt low in manganese. For example, there is such a metal, with manganese as low as 0.06 produced commercially containing 98 per cent cobalt and higher. To this foil can be added an excess of the titrating solution, which will eliminate from the foil any brown shade due to the 0.06 per cent manganese. If the chromium present should be as high as 4 per cent, then not the slightest pink color of the cobalt appears. It is therefore entirely eliminated from the end point color if

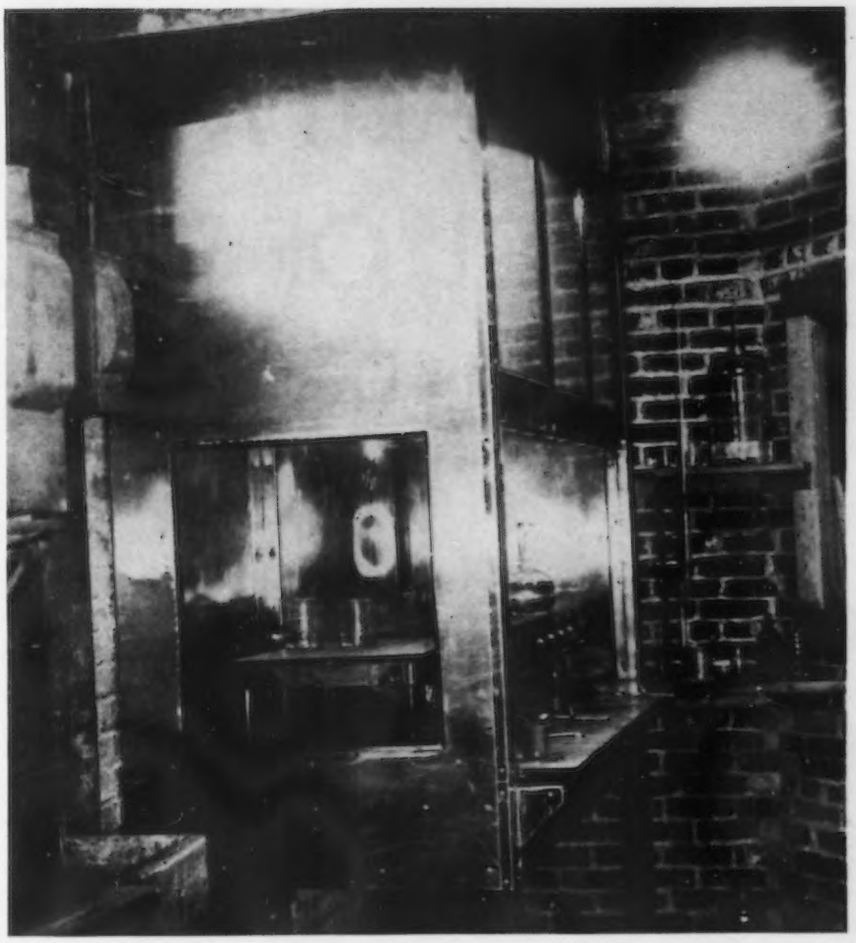


FIG. 2—By far the best type of hood to use with perchloric acid is one such as this made of stainless steel. A wooden hood is always endangered by charing.

dichromate is added, even though about 37 mgs. of metallic cobalt should be present, as in a 37 per cent cobalt steel, when using 0.100 gm. of sample for the analysis.

Method for 37 Co Steel

A 37 per cent cobalt steel containing 4 per cent tungsten and 6 per cent chromium was dissolved by heating 0.100 gm. in 12 ml. 1:1 $HClO_4$ (60 per cent C.P. $HClO_4$ diluted with an equal volume of water).

When the steel is dissolved, the solution is taken to heavy fumes of $HClO_4$ and boiled at heavy fuming for one minute. On removing from the heater and cooling there should be red crystals on the inside surface of the cover glass. The cover and sides of flask are rinsed down with an H_2O jet and 10 ml. H_2O is added. The contents of flask are boiled three minutes with the cover off the cone flask. After cooling 10 ml. $AgNO_3$ + 15 ml. $(NH_4)_2S_2O_8$ are added, and the solution is then boiled nine minutes. Cool and titrate all brown tints to a yellow, matching against the usual foil, to which an equivalent amount of tungstic acid is added at the start. The tungstic acid was not removed before titration.

Using a specimen of about 37 Co, 6 Cr, 4 W, and 0.85 C, three tests by the $HClO_4$-$AgNO_3$ showed 0.62, 0.63 and 0.64 per cent Mn respectively, and from a test on the same sample by the old standard method and PbO_2-$HClO_4$, 0.64 per cent Mn was obtained.

High Manganese

Still another way of determining high manganese involves solution of the steel in perchloric acid and the precipitation of the Mn as manganese oxide. An advantage is that larger weights can be used and the complete solution of the chrome carbides is assured.

In a sample running 4 to 12 per cent Mn, dissolve 11 gm. of sample in 25 ml. of perchloric acid plus 20 ml. HCl, using 600 ml. beakers. Heat until the metal is dissolved, then take to heavy fumes or until the black carbide residue is gone.

After cooling add 100 ml. H_2O and boil for five minutes, boiling off all

(CONCLUDED ON PAGE 22)

QUALITY CONTROL OF STEEL

o o o

By RALPH F. BISBEE

Chief Inspector, Westinghouse Electric & Mfg. Co., Mansfield, Ohio.

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CONTROL of quality of Westinghouse products is based, to a large degree, on the quality control of "bought-outside" material. If in error a large quantity of material that is defective were to be passed through the receiving department, the unfortunate results below would be inevitable:

(1) Production suffers. The production department depends upon this material when it starts through the manufacturing processes, and if it proves defective, production is delayed until new material is available.

(2) Extra expense is incurred, due to extra handling and lost time.

(3) Quality suffers. In an emergency it would be necessary to use the material at a sacrifice of quality. Therefore proper control of quality maintained in the receiving department assures a product that will give the maximum life without trouble.

Over a period of years Westinghouse has prepared from experience a receiving "Control of Quality" manual. This manual lists all parts that are to be detailed 100 per cent or spot checked, also material that must be approved by the laboratories before acceptance.

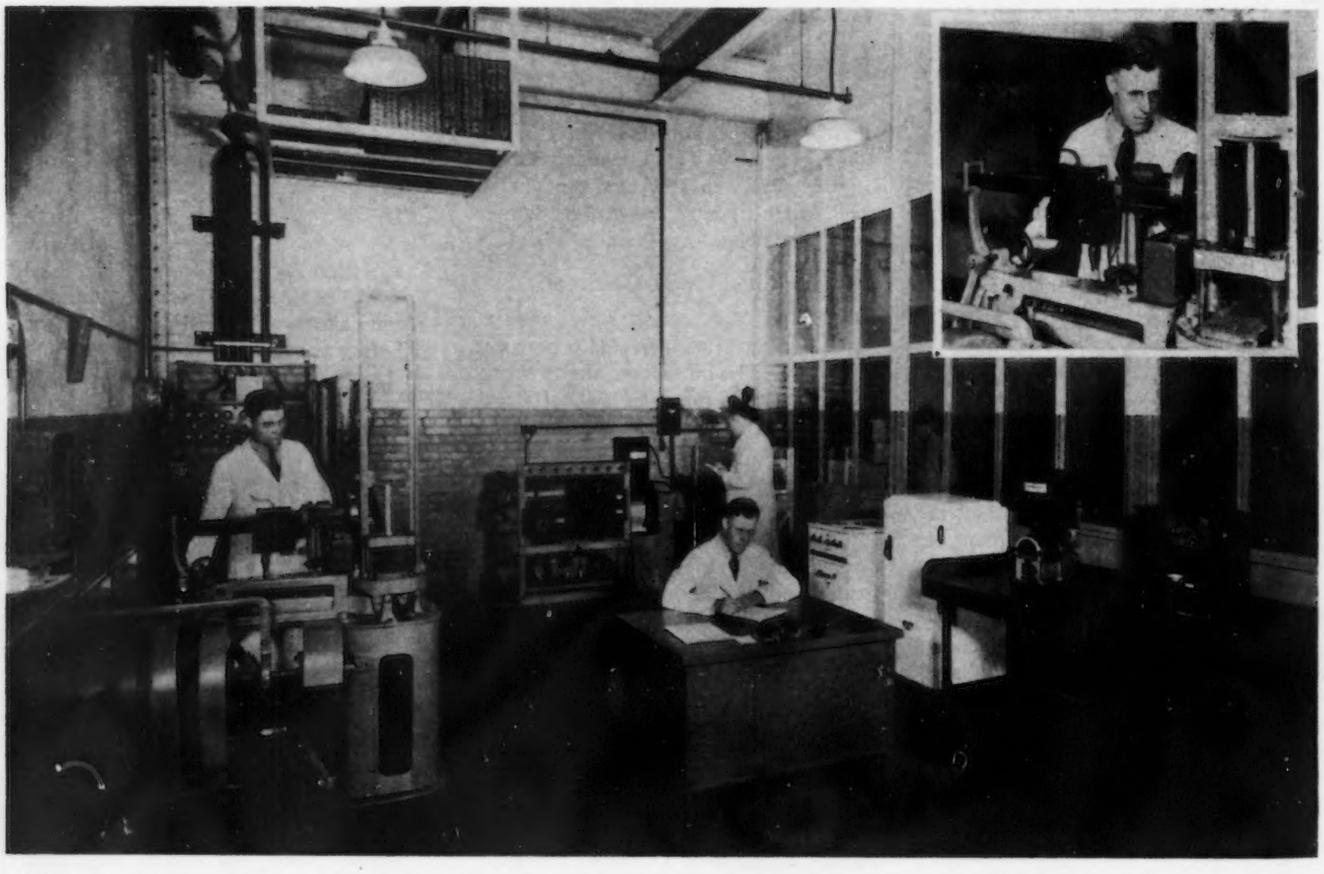

FIG. 1—Samples of incoming material, requiring important checks for physical requirements, are routed through control laboratories before release to stock. Inset shows steel being tested for elongation.

All "bought-outside" material requiring important inspection for physical requirements, electrical, thermal or chemical, is routed through control laboratories (Fig. 1) before being released to the stock room.

The control system for steels is interesting and will be described in the following paragraphs. The finishes which will be applied to the steel are synthetic enamel, black japan, vitreous enamel, nickel plate, chromium plate, and many others. Considering the volume and variety of finishes and applications handled, it is obvious that a very strict control system is necessary.

When a shipment of steel is received, it is checked by inspectors for quantity and quality before its acceptance. Samples are taken from shipments of all deep drawing steels, regardless of kind, and sent to the laboratory. They are passed through three physical tests, (a) cup test on regular Olsen testing machine to determine ductility; (b) Rockwell hardness tests, to determine surface hardness; and (c) elongation tests on a regular Olsen universal testing machine to determine elasticity.

From experience it has been found that the above combination of tests enables the metallurgist to predetermine if the steel will draw as the plans specify. There have been rare cases where the grain has been abnormal, in which case the tests would not detect the abnormality. However, such cases have been few and far between. The three tests, however, are generally completely sufficient in predetermining before release whether the steel will perform satisfactorily. Production is thus not interrupted and losses are kept to a minimum.

It is very important that steels which will be finished with paint shall have a surface with enough tooth for proper adhesion. For example, all of the Westinghouse refrigerator cabinet wrapper sheets which require a white Dulux painted surface are checked as follows:

Samples 3 in. square are taken from each shipment and routed to the laboratories. The laboratory cleans off the surface of the steel, places it in a photomicrograph machine, and compares it (at 30 diameters) with "go" and "no go" standards for surface teething. The standard photomicrographs are shown in Fig. 2. The one sample (No. 1) is steel that is too smooth for proper adhesion. The surface has been cold worked with smooth rolls to the point that it is practically as smooth as a piece of glass. A second sample in Fig. 2 (No. 2) shows an ideal tooth condition for proper adhesion. Notice the uniformity and depth of the teeth. A third sample in Fig. 2 (No. 3) shows the maximum roughness allowable.

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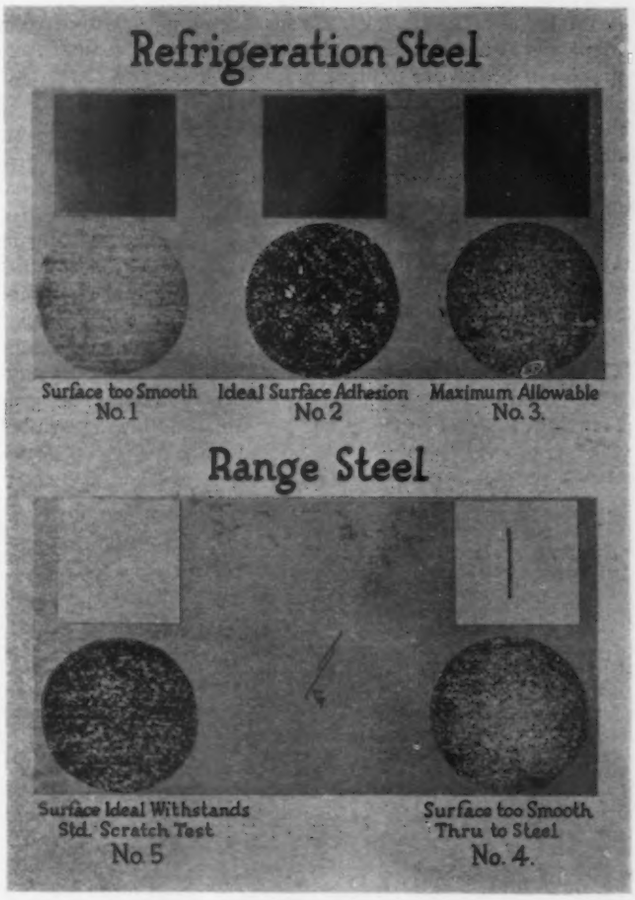

FIG. 2—Standards used for comparing surface teething. White area, top of teeth; black is base at 30 diameters.

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The two lower views (Nos. 4 and 5) show steel subjected to a standard scratch test. It will be noted that sample No. 4 has better adhesion than sample No. 1 and No. 5 is not quite so good as No. 2. These samples were processed with regular primer and finish coat of Dulux at the same time, and were baked in the same ovens. The scratch test on sample No. 4 shows both the finish and primer coat removed to the base metal, due to the fact that there were no teeth to hold the primer coat to the steel. On sample No. 5 the finish coat is removed, but the primer coat is still adhering to the teeth or surface of the steel.

Several years ago when these standards were being developed, the steel companies had considerable difficulty in trying to standardize on a surface that would meet the Westinghouse requirements. However, some steel companies finally worked out a method of shot blasting the final cold rolling rolls, which results in a very economical and uniform "toothed" finish on the steel. At first there was much opposition in trying to standardize on proper adhesion for paint surface, but after a way was found by the steel companies to do this the trouble disappeared.

Occasionally a steel supplier becomes careless and allows the final cold roll to become worn to the point that it does not give the proper tooth in the surface of the steel. In this case the receiving laboratory rejects the shipment.

Steels to be vitreous enameled are checked as follows:

(A) Bond test. Following the regular physical tests a sample is sent to the laboratory where it is given a ground coat of enamel. Then it is tested in a regular impact tester, after which the percentage of area with the enamel still adhering is determined. Limits have been set up so that a determination can be made as to whether the steel is satisfactory for bond adhesion. The height of drop of a 5-lb. weight varies according to the thickness of the steel.

Experimentation is now under way

in the laboratories to check the surface by means of a comparator. The photographs in Fig. 3 are explanatory. The steel with the smooth surface has been taken from a lot that has given trouble, due to poor enamel adhesion, while the steel that shows good uniform teething comes from a lot that has proved satisfactory by actual tests after enameling. This method may supersede the regular bond test method that is used by most control laboratories.

(B) Sag test. Tentative sag tests have been established through the Porcelain Enamel Institute and are being tried out by the committee members in charge. The tentative sag test will be sent to all who are interested, and tried out before it is definitely established as a standard. In this way all variables encountered in different types of enameling can be taken into consideration. However, the Westinghouse method, which has been used for the past several years, lines up very favorably with the institute's tentative test, except for size of samples and fulcrum points.

The samples tested by Westinghouse are 2½ in. by 11 in., placed on a rack of ¼-in. nickel chromium with 9-in. centers, the entire unit then being placed in the center of a furnace which has been heated to 1580 deg. F. The samples remain in this heat for ten minutes, after which they are removed and allowed to cool to room temperature. Then the sag from the horizontal is measured. The results obtained are of a comparison type.

(C) Enamel performance test. Every three months Westinghouse grades each supplier of enameling steels. This grading is arrived at by comparing actual performance and by examining rejects, both in the ground coat and finish coat. A committee, composed of the superintendent of the enamel division, the tool division, and the chief inspector, grades the suppliers and sends a report to the purchasing department, together with a chart. The grading is based on the following symbols: AA, very satisfactory (above commercial); A, satisfactory, B, satisfactory, but not so good as A; and F, failure.

A supplier falling into the F class for two or more months is placed on the unapproved list of manufacturers. It is then necessary for this company to send in several shipments of samples before they are again placed on the approved list, if the samples are found to be satisfactory by the laboratory.

Other steels, such as cold rolled strip for nickel plating, are checked in a similar manner. However, the method varies according to the application.

An adequate quality control system means "prevention rather than cure." Adherence to an intelligent central scheme eliminates confusion and misunderstandings with suppliers; production flows evenly and schedules are met; costs are maintained and higher quality results.

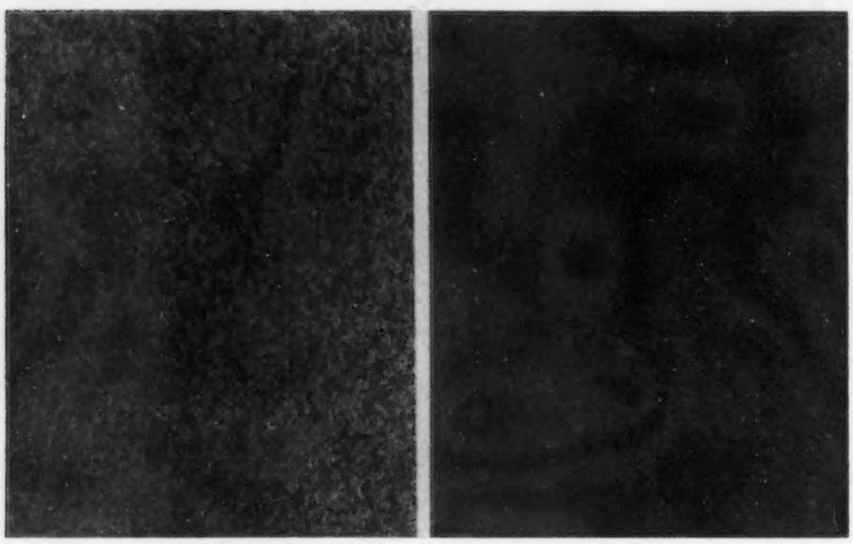


FIG. 3—Illustration shows, left, a good adhesion by the new photo method, and right, a poor adhesion surface. At 10 diameters.

Perchloric Acid

(CONTINUED FROM PAGE 19)

chlorine fumes, that is, all smell of chlorine. Dilute to 300 ml. Neutralize some of the free acid with 1:1 NH_4OH and introduce 16 gm. of ammonium persulphate. Boil for 15 min. after the manganese oxide precipitate forms, and then filter through double No. 31 paper. Wash 50 times with water, and transfer washed papers to original beakers and add, as usual, a measured excess of ferrous standard. Then back titrate this excess with the equivalent $KMnO_4$ standard. Add 5 gm. more of ammonium persulphate to filtrates and boil for 15 min. to note if more manganese precipitates. If precipitate forms, filter as above and titrate, adding to the original. Be sure the persulphate crystals are of full strength, otherwise low results may be obtained.

A 3.75 per cent manganese steel as a standard gave a factor of about 0.375 per cent Mn when 1 gm. was taken for analysis. Or, it is also possible to prepare a synthetic standard, for example: 0.3 gm. of 14 per cent Mn steel plus 0.6 gm, ingot iron No. 55 and 0.3 gm. dichromate, the two former totaling 42.114 mgs. of Mn.

Mn in Iron Ore

The same weights of the finely ground ore as are used for steel are digested in 10 ml. of concentrated hydrochloric acid until only a floating residue remains. The same amount of 60 per cent perchloric acid as is used in steel is then added; take to heavy fumes and then complete the analysis as described in the section devoted to manganese steels.

The arsenite solution can be standardized by a U. S. Bureau iron ore standard, or by a works' standard in which manganese has been previously determined by the old standard procedures. Satisfactory and consistent results have been obtained by the foregoing procedure.

Allis-Chalmers Mfg. Co., Inc., has leased space in the Industrial Office Building Corp. building at 1060 Broad Street, Newark, N. J., for a New Jersey sales office.

Fellows Gear Shaper Co., Springfield, Vt., has moved its Detroit office from 616 Fisher Building to 814 Fisher Building.

Larger Air Conditioning Market Through Better Distribution

By P. Y. DANLEY

Manager, Air Conditioning Department, Westinghouse Electric & Mfg. Co., East Springfield, Mass.

THE market for air conditioning equipment may be expected definitely to broaden during the coming year. We can base our optimism, it seems to me, on the following three factors:

1—Continued consumer acceptance and popularity.

2—Better and wider distribution.

3—The introduction of a broad line of packaged units in capacities up to 15 tons for both inside and remote installations with duct systems.

Installed equipment sold by members of the Air-Conditioning Manufacturers Association exceeded the anticipated total of $85,000,000 in 1937 compared with sales of $50,000,000 in 1936. An increase of 40 per cent in horsepower of the 1937 utility installations over 1936 was also reported. The average horsepower estimate or 20.1 for 1937 showed a slight increase over the average for 1936, and the increase is accounted for by the large hotels, theaters, restaurants, department stores, hospitals, mortuaries, etc., that installed air conditioning in 1937.

According to available statistics the residence applications account for less than 1 per cent of the 1937 volume. It appears that while the residential market should be a most lucrative one, and a market that should be carefully studied and cultivated, it will follow the smaller commercial application in development. Here again product and distribution seem to be at least partially responsible for the failure of residential sales to be of more significance.

All indications point to an expansion of the market in the direction of apparel shops, markets, offices, hospitals, theaters, restaurants, schools, depots, barber shops, department stores, etc. And we certainly won't have to worry about saturation in this market for many years.

The vast market awaiting the industry, provided the product and distribution problems are solved, is reflected from the fact that there are some 40,000 dry goods and small department or general stores; 125,000 restaurants; 64,000 beauty shops and barber shops; and about 58,000 drug stores.

Add to this list the thousands of candy stores, small offices, apparel shops, banks, theaters, mortuaries, and a dozen additional prospects, and you will have some idea of the magnitude of the market.

The prospective market here cited represents going concerns; it does not include new building and construction that is now hitting its stride.

This mass market is now opened to us through the medium of "packaged" air conditioning, observed as a trend in 1938 but an important factor in 1939. It is important because it eliminates the engineering of the refrigeration cycle on unit installations from 1 to 15 tons. I believe that the introduction of the packaged unit is the most significant contribution to the expansion of the air conditioning market since its earlier stages of development.

By packaged air conditioning, I mean a unit for the contractor which has all refrigeration connections, internal wiring, piping of refrigerant and the like—factory built and tested.

The introduction of packaged units will increase the potential market because:

1—It makes for wider and better distribution. (a) It eliminates the need for refrigeration work on the job. (b) It opens the air conditioning business to the smaller heating and ventilating contractors who have stayed out because of technical engineering difficulties.

2—It makes for better lower-cost installations. (a) Much of the technical planning and contract work is eliminated. (b) The units are lighter in weight and smaller in size than formerly.

Not only are we at Westinghouse predicting the opening of this mass

market, but we have changed our distribution to take care of the anticipated increase in sales and promotion. This thinking on our part is the result of many surveys, field experiences and carefully planned promotions.

Large Contractors for Big Jobs

Although Westinghouse is doing everything to make it easy for small contractors to apply air conditioning to ordinary homes and shops, the large heating and ventilating engineering organization remains the backbone for big custom-built jobs. Where a small contractor uncovers a complicated application, we expect to provide a direct tie-in with our regular engineering contractors to make available up-to-the-minute engineering practice.

Approximately 100 authorized engineering contractors in as many cities had produced a very satisfactory volume in 1937, but during the recession this volume decreased by half. In analyzing our territories, we made some startling discoveries. The 100 engineering contractors had territories averaging almost half a state each. Yet they had been cultivating only their own cities. On maps which we prepared, the distribution picture showed a grouping of installations in and very near to headquarters cities, but practically nothing in the rest of the territories.

Upon further analyzing each territory we discovered that outside the headquarters cities there were a total of 400 other important cities each with a good-sized trading area, each with good business, each filled with stores, hotels, restaurants, beauty parlors—every other commercial outlet for air conditioning. Those towns had not been cultivated.

But half a state is a very large territory. The only way to cultivate such broad business opportunities is to set up our present outlets to distribute to associate engineering contractors in the important smaller towns within their territories. And with a "packaged" line of units we feel through these distributers we have something worth while to offer these associate contractors. We have eliminated the mystery and complicated refrigeration work on the job.

Provision Made for Residential Market

To give these smaller-town heating and ventilating representatives a year-around, all-market, one-brand line to sell, Westinghouse Home Heating and Air Conditioning will be offered. The line has been sufficiently expanded to cover the field. There are now three lines of gravity coal-fired furnaces and a line of gravity gas-fired furnaces; conversion oil burner; blower-filter units; boiler-burner units for oil and later for gas; winter air conditioning units for oil, gas, hand or stoker-fired coal; and for summer cooling, packaged units which may be installed in the supply duct of winter air conditioning systems to add summer cooling and dehumidifying and convert the system for a year-around service.

Set-up Registers for Metal Working Machines

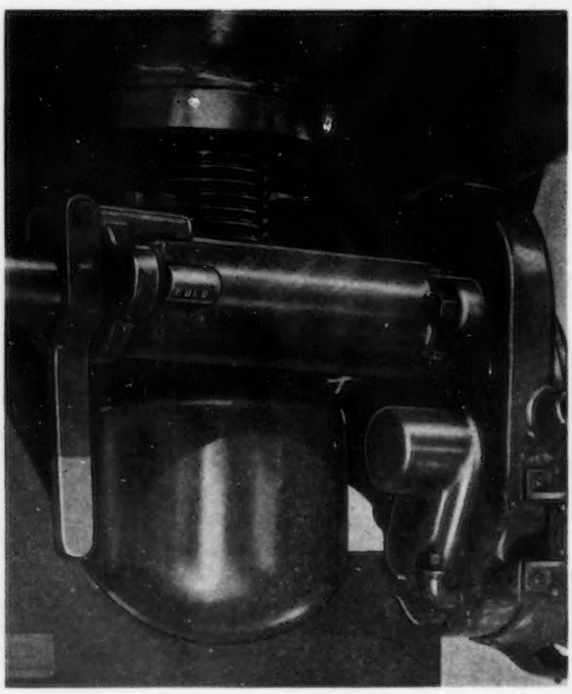
A RECENT development for improving the efficiency of various types of metal working machines by increasing both speed and accuracy of the setting up operation is the set-up register. These devices are commonly high precision types of revolution counters. A typical counter for this purpose is shown in Fig. 1. The drive shaft of the counter or register is connected by appropriate means to the adjusting shaft, screw-down, or spindle feed of the machine. Any adjustment of the machine up or down appears as a figure on the dials of the register. These figures may be regarded as vernier scale marks on the vertical slide of the machine, which can be read at any point and recorded for future use. The register may be arranged to record settings in thousandths of an inch, or even ten thousandths of an inch, if desired.

The operation of press brakes with their long dies is especially improved by the use of a set-up register on each end of the brake. When the press brake has been accurately adjusted for a new die, the set-up register on each end is read. The two readings are not likely to be the

(CONTINUED ON PAGE 62)

AT LEFT

FIG. 1—A ball-bearing worm drive revolution counter frequently used as a set-up register. The drive shafts, which may project at top, bottom, front, rear or ends, are connected to the adjusting drive, gears, or screw of the machine.



AT RIGHT

FIG. 2—Set-up register applied to the right screw of a cold forming and shearing machine.

FIG. 1 — Crude rubber as formerly stored (right) and as now stored on double-faced pallets.

How General Electric Handles Cable

By C. H. BARKER, Jr.

Supervisor of Production, Appliance & Merchandise Department, General Electric Co., Bridgeport, Conn.

MANUFACTURERS of cable, particularly of the larger and heavier varieties, have been confronted with the problem of finding a more economical means of handling process reels of cable between manufacturing operations. Every known method—such as overhead cranes, cradle-reel trucks, platform-reel trucks, conveyors, manual labor, and turning with the aid of turntables or crutches—has been tried. Some of the methods have provided fairly satisfactory results in certain phases of the work, but few could always be adapted to varying situations. In many instances these systems involved the tying-up of floor space, lacked flexibility, required excessive labor and time, and even introduced safety hazards.

In Bridgeport, General Electric is concerned with the manufacture of all cords and cables carrying rubber or similar synthetic insulations. Among the raw materials involved are: rubber in various forms, waxes, powders, yarns, paper, copper, lead, and metallic tapes. Each is bulky and is handled in heavy units. With a large volume of movement, the handling and storage of this material presents a major problem.

A contrast of the old and new methods of stocking representative materials indicates the economies possible when the problem is scientifically studied. Fig. 1 shows crude rubber in storage both as formerly stored (at right in photograph) and as at present. Today the baled rubber is placed on pallets in the freight car when stored. The pallets sometimes are tiered four-high. Rubber is delivered to the point of consumption in pallet units and is handled directly from the boxes when used.

Even 4000-pound loads of various powders required for rubber com-

AT LEFT

FIG. 2—4,000-lb. loads of powders for rubber compounds are now stored on double-faced pallets.

BELOW

FIG. 3—4,000-lb. loads of pig lead are now stored and handled by fork-type industrial trucks without the use of pallets.

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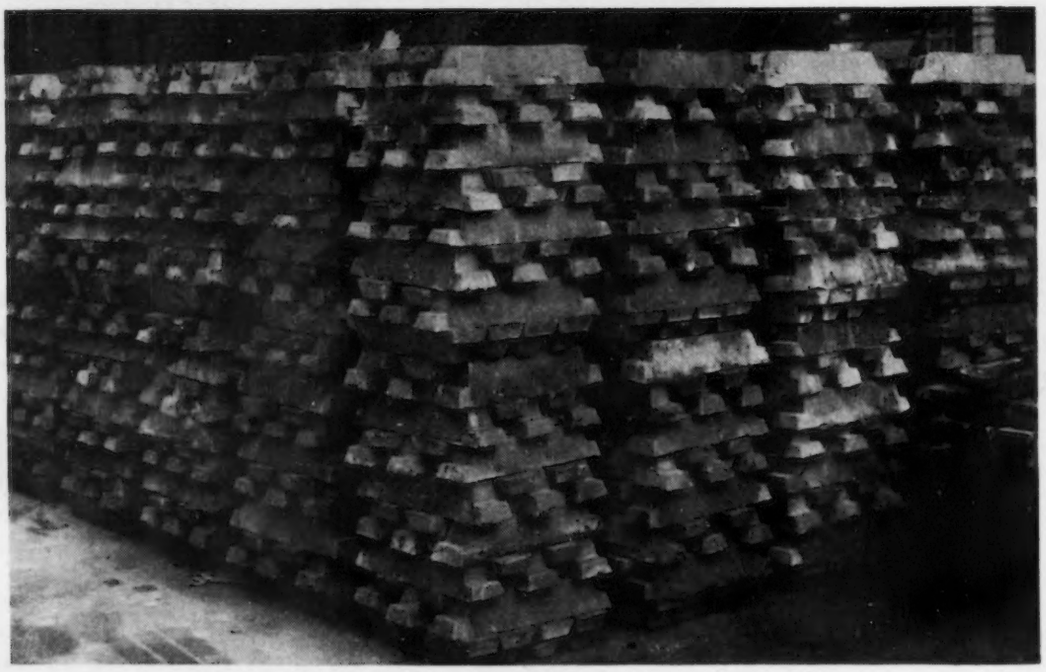

BELOW

FIG. 4 — Large reels of cable weighing from 7,000 to 11,000 lb. each are readily handled by adjustable fork-type industrial trucks.

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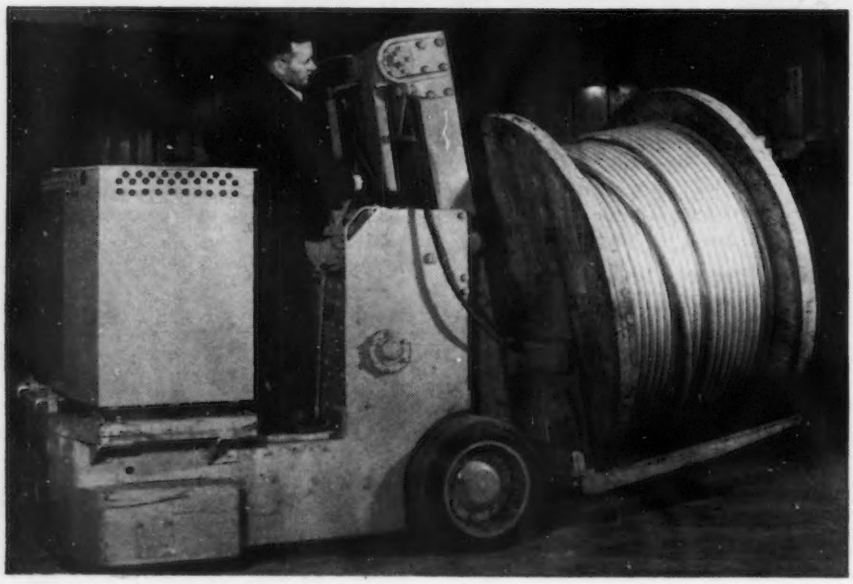

pounds can be handled by fork truck and pallets (Fig. 2). Anyone familiar with the handling of bagged material knows the expense, waste, and dirt which is involved if handling is not scientifically directed. Heavy drums formerly were merely piled on top of each other, resulting both in much labor and in damaged drums. Today similar drums are handled on pallets and although there is no space saving due to the limited headroom, the handling and damage savings are appreciable.

Lead or any pig metal may be dangerous and expensive when handled by hand. Fig. 3 shows the neat storage piles possible with the application of fork trucks. The forks are inserted under the inverted lip of the pig, and lead is transported in 4000-pound

units. The lead is received in barges in 4000-pound piles and is handled in that same unit to the point of consumption. Formerly, it was handled on 48-inch-square skids which consumed considerable floor space at the lead presses. Today the expense of placing lead in storage is approximately 10 per cent of the former amount.

A new G-E method of storing band steel is now standard. Here again the material is handled in a unit from the point of completion at the vendor's plant to the point of consumption. Then the strapping is cut and magnetic push-button controlled electric hoists are used to place the heavy coils on payoffs. An almost unbelievable reduction in spoilage has been achieved as a result of improved handling methods. Accidents have been greatly reduced.

Hand-pallet trucks prove desirable for very short hauls, particularly where power-pallet trucks are available only periodically.

Heavy fork trucks may be used for moving large reels of copper conductor finished cable, or cable in various stages of manufacture, on process drums. Incidentally, this was the first installation of fork trucks for the handling of reels. In order to make the contemplated use practical, it was necessary for the truck manufacturer to develop motorized adjustable forks controlled by push buttons from the operator's platform. The forks were specially shaped to provide surface contact for all reels to be handled. It is commonplace to handle reels weighing 7000 pounds (Fig. 4) with the trucks. Reels weighing up to 11,000 pounds have been handled thus.

Due to the presence of considerable talc and other powdered compounds, gas engines could not be utilized for

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ABOVE

FIG. 5—Former method (right) of storing reels of copper conductors, contrasted with new standard practice (left).

AT RIGHT

FIG. 6—Smaller reels of copper conductors stacked eight reels to a pallet, and tiered five pallet-loads high.

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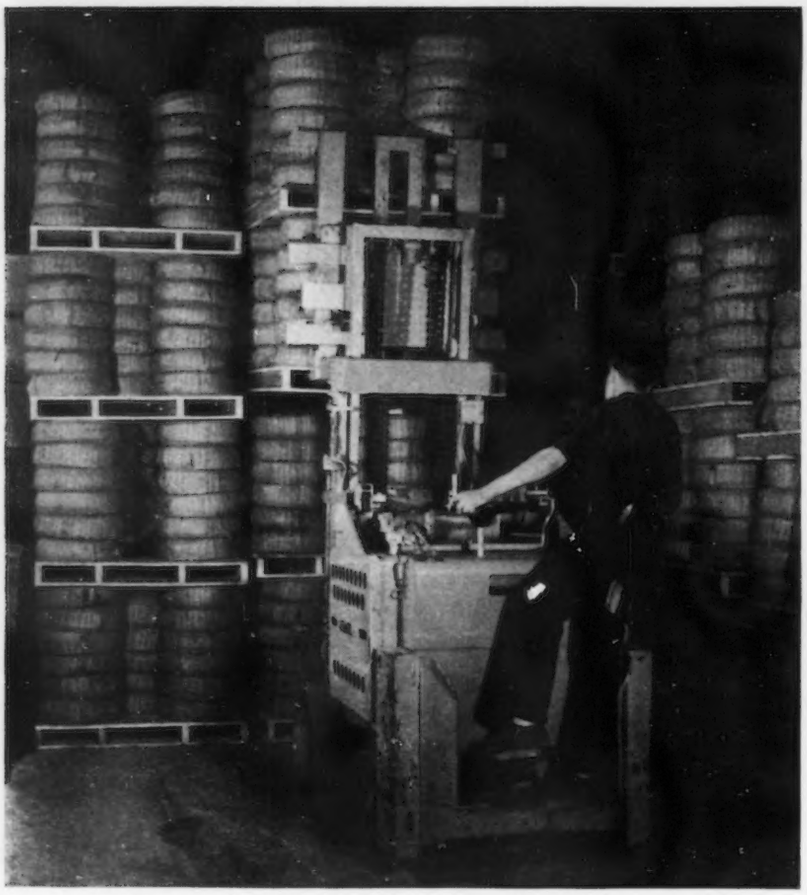

FIG. 7—Coils of insulated wire are stacked flat on pallets and tiered four pallet-loads high.

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the 24-hour service required of these trucks. In addition to the exhaust blowing compounds around in working areas, it was felt that carbon monoxide might be a hazard in certain areas under mezzanine floors. The steel-encased battery on the rear of the truck was developed by battery manufacturers so that the trucks could be operated for three continuous shifts each day with but one change of batteries. These batteries are changed very quickly and easily by using adjustable conveyor type transfer portable tables. The savings realized in the use of these trucks have even surpassed those anticipated, having enabled better utilization of manufacturing equipment in addition to reduced handling expense.

Fig. 5, at the right, shows the former standard practice for storing reels containing copper conductors. To prevent the wire from becoming tangled, it was necessary to place the reels on the edges of the flanges. By providing a supplementary metal frame which could be dropped in place on top of the standard wood and steel pallet as shown in the left foreground of the same photograph it is now possible to handle reels from 24 in. to 36 in. in diameter in pallet units and tier them like any other palletable product.

An earlier use of the same idea using a wooden supplementary frame held in place by metal dowels in a wooden pallet, is shown in Fig. 6. Some idea of the savings in space, possible with a reduction in handling

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FIG. 8 — Cable sold in comparatively short lengths is wound on reels which, by means of an elevating fork truck, are tiered five reels high.

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expense in the storing of reels of certain types of finished cables which cannot be stored flat on the reel flanges, is indicated in this view.

Much has been done in storing coils of insulated wire (Fig. 7). Each pallet load weighs 3500 pounds. Note that the operator can place two pallet loads on top of two pallets in one operation.

Certain types of cables, such as Parkway, Entrance, and all rubber portables, are frequently sold in comparatively short lengths. Formerly the reels were stored on the flange edges, taking up considerable space and making most of them very inaccessible. With the use of a fork truck, the forks are inserted just below the upper flange of the desired reel, and the reels above are all lifted off in one operation (Fig. 8). The pile is then set on the floor and all but the reel desired lifted and put back in place. Protectors are slipped over the forks for this operation to prevent damage to the cable.

Hand pallet trucks of both the open and closed pallet type find their place as supplementary equipment in this department. Noticeable features of the new method of handling and storing these materials and finished products are neater housekeeping with an accompanying ease of accessibility to older stock so that it can be consumed or shipped first without extra handling expense.

A good criterion to follow is that your handling methods can be improved until you have practically eliminated handling.

Mn Content of Cast Iron Increased by Ore Additions

EXPERIMENTS in the use of manganese ore in place of ferro-manganese to increase the Mn content in low-manganese irons are discussed in a recent issue of *The Foundry Trade Journal*.

The author of the discussion, B. Ramaseshiah, foundry superintendent of the Mysore Iron & Steel Works, Bhadravati, India, states that the aim of the experiments was to determine the possibility of eliminating the use of ferro-manganese additions in the ladle or cupola by utilizing manganese ore added directly to the cupola charge.

In the first experiment, the ore, sized to 3 to 4 in. diameter, was added directly to the metal charge. The Mn pick-up in this case was found to be very small, about 0.17 per cent. It was adduced that most of the material must have been lost in the cupola slag.

In the second experiment, the ore was mixed with coke breeze to expedite reduction and charged over the coke layers in the stack. This method resulted in a pick-up of 0.35 per cent Mn.

For the third experiment, powdered ore was mixed with coke breeze and added between the metal charges. This procedure resulted in a pick-up of 0.37 per cent Mn.

Ore Put in Iron Containers

Ore, broken in small pieces, mixed with coke breeze and soda-ash and packed in cast iron containers and placed in the stack on top of the coke charges, was the procedure tried in the fourth and fifth tests. The Mn gain in these two experiments dropped to only 0.26 per cent.

(CONTINUED ON PAGE 61)

Results of Experiments in the Use of Manganese Ore in the Cupola

Test No.	Charge (Cwts.) Grades I	II	III	Scotch	Foundry scrap	Mn. in charge	Mn. expected in melt	Mn. in sample (aver.)	Mn. in cast ingot mold	Mn. pick-up	Expected pick-up	Limestone in charge	Method of adding the manganese ore
						Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Lbs.	
1	—	—	—	—	32	0.28	1.03	0.61	0.45	0.17	0.22	—	1 cwt. ore charged on first charge.
2	—	—	—	—	32	0.28	1.03	0.50	0.63	0.35	0.466	20	56 lbs. ore added over first four charges, with addition of 50 lb. coke.
3	—	—	—	—	32	0.28	1.03	—	0.75	0.37	0.493	20	1 cwt. ore charged between first and second charges.
4	—	—	—	—	32	0.28	1.03	—	0.54	0.26	0.36	30	1 cwt. ore mixed with two baskets of coke breeze with addition of ½ lb. soda-ash and tar to bind. This was packed in cast iron troughs and charged between first and second charge.
5	12	10	—	—	10	0.45	1.20	0.63	0.71	0.26	0.36	30	Do. do. do.
6	12	10	—	—	10	0.45	1.20	1.17	0.99	0.54	0.72	30	Alternate layers of ore and coke breeze with small amount of limestone powder put in 2 baskets and placed on bed coke and over this the first charge of iron was charged.
7	—	12	6	4	10	0.42	1.17	0.98	0.86	0.44	0.52	30	As above, but with addition of about ½ lb. soda-ash.
8	—	12	5	4	10	0.42	1.17	0.85	0.88	0.46	0.61	30	Do. do. do.

In every case the weight of manganese ore added was 1 cwt., containing 34.3 per cent Mn. A basketful of coke breeze weighs 50 lbs.

High Strength of Furnace-Brazed

ONE of the first questions to occur to a prospective user of any metal-joining process is: "How strong is the resulting joint?" Properly made furnace-brazed joints have been shown to have great strength, which in the case of copper-brazed assemblies, is attributed to the alloying effect between the copper and the iron and a knitting effect between the two iron surfaces. This article is the eighth in the series on electric-furnace brazing, begun by Mr. Webber in THE IRON AGE of Sept. 8.

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STRENGTH and breakdown tests made in laboratories have shown in general that furnace-brazed joints have great strength. In fact some joints have been found to have greater strength than the parent metal, and such samples break in the parent metal rather than in the furnace-brazed joints.

The actual strength which will be obtained in any assembly depends upon a number of factors such as cleanliness of the surfaces within the joints, analysis of the parent metal and brazing metal, tightness of the joints, time in the heat, furnace temperature, subsequent heat treatment, etc.

It can probably be said safely that the average copper-brazed joint has considerably better strength than copper. This can be traced to an alloying effect between the copper and the iron, and a knitting effect between the two iron surfaces, both of which contribute to good strength. It is not safe to count on obtaining the strength of steel within copper brazed joints in production, but with good supervision of the above factors it is reasonable to expect the strength to be about midway between the strength of copper and the strength of the steel used. The following examples and charts will bring this out more clearly.

Some very interesting data on the shear strength of copper-brazed joints under various conditions have been collected by George Oswald and Walter Homan of the National Cash Register Research Laboratory. Their results are given in the accompanying charts. All samples were of the "pull-out" type consisting of 9/32 in. diameter steel rods copper brazed into washers of similar material 5/32 in. thick, the copper fillets having been removed after furnace brazing in order to make the results as accurate as possible.

Effects of Tightness of Fit in Joints

The first investigation was to determine the effects of the tightness of fit on the strength of copper-brazed joints. Ten samples were prepared for each of four different degrees of tightness, varying from loose joints with 0.003 in. gap to an 0.015 in. drive fit. The results are plotted in Fig. 70 showing the minimum, average, and maximum values obtained by testing each lot of ten low-carbon steel samples which had been in the brazing heat 20 min. In the group having 0.003 in. gap only six out of the 10 were considered in the results because the other four were imperfectly brazed due to copper not filling the joints entirely. All of the remaining samples, however, were properly brazed in regard to copper flow.

The results of this test are interesting in that they illustrate the desirability of having a snug joint with no gap as compared to having a loose joint with 0.003 in. gap, there being a marked increase in strength with the snug joint. But even with the loose joint the strength is on the high side of the accepted average shear-strength of copper. It should be remembered, however, that with the loose joint all of the samples were not completely brazed, which shows that a snug joint is desirable in production for the sake of uniform strength and tightness.

Nothing Gained by Drive Fits

This series of tests also illustrates the fact that no particular gain is made by resorting to extreme tightness of fit, so far as strength is concerned. On the other hand it also shows that

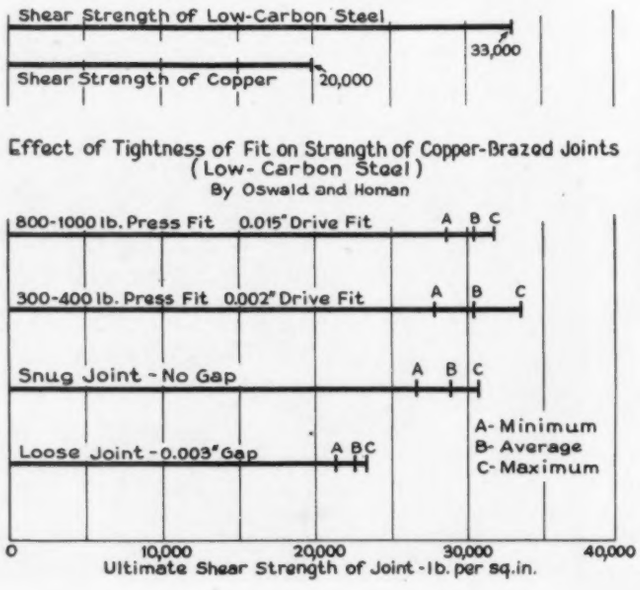

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FIG. 70—Results of tests made to show relative strength of copper-brazed joints with various degrees of tightness of fit, compared with (top) the shear strength of annealed low-carbon steel and copper. The greatest strength can be obtained with tight joints. Many of the values approach the strength of steel.

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Joints Explained

By H. M. WEBBER
Industrial Department, General Electric Co., Schenectady, N. Y.

excellent strength is obtained regardless of the fact that extreme pressures have been resorted to. It can be said that in general copper will creep through a joint regardless of how tight it might be if given ample time and temperature. However, increases in tightness require a longer time in the furnace for the copper to go or creep through the joints, which slows down the rate of production. Accordingly for best all around results it is suggested that wherever possible joints be made with good, uniform steel-to-steel contact, but that no effort be made to have a drive fit.

A press fit of 0.001 in. per in. of diameter is generally ample for most purposes, and it is recommended that this be the maximum wherever practicable. One manufacturer noticed that copper would not creep through some of the joints in each trayload of assemblies, unless the unsatisfactory assemblies were put through the furnace two or three times. It was found that with the tolerances used some of the assemblies had heavy press fits while others ran from size-to-size to light press fits. Simply by easing up on the tightness of those having heavy press fits, the copper flowed through all joints nicely and gave uniformly high strength.

While snug fits are generally best when brazing with copper, slightly loose fits are preferable for the more viscous brass and silver-brazing alloys. Instead of having intimate contact between the parent metals, as for copper brazing, gaps of 0.001 to 0.003 in. are recommended for brass or silver brazing.

Fatigue tests on butt-brazed joints of low-carbon steel, copper brazed and run on a standard R. R. Moore rotating-beam-type fatigue machine by Messrs. Oswald and Homan, show a fatigue limit of approximately 15,000 lb. per sq. in. This value is considered good in view of the fact that such joints create a decided notch effect in the test specimens.

Numerous tests have been made to determine the strength of furnace-brazed joints using silver-brazing alloys, and 25,000 lb. per sq. in. in shear is usually considered a conservative value to use in making calculations. Much higher strength can be obtained under favorable conditions.

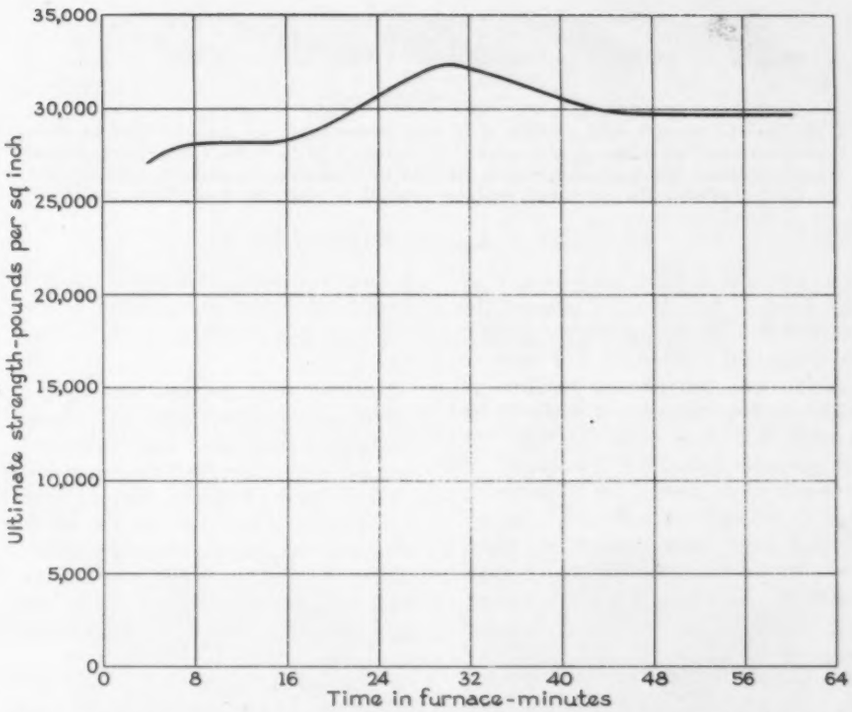

FIG. 71—There is a slight gain in strength in copper-brazed steel assemblies up to a certain point, as the time in the heat increases. The average user disregards this fact, however, and employs a minimum soaking time, probably stopping where this curve begins.

Effects of Time in Furnace

The effects of the length of time the assemblies are in the heating chamber were next investigated by Messrs. Oswald and Homan. Samples similar to those mentioned above were assembled with press fits of over 200 lb. As before, and in all subsequent tests reported here, 10 samples were used for each different condition. The average strengths of each group of 10 low-carbon steel samples in this second series of tests are plotted in the chart Fig. 71. The samples were held in the furnace for seven different periods of time varying from 4 to 60 min. These tests demonstrate that there is some gain in strength as the soaking time increases to a certain point, beyond which there appears to be no increase and actually a small decrease. For the samples in question this maximum appeared at 30 min., although it should be kept in mind that the results of such a test might vary considerably with different types and different weights of samples. It might also be pointed out here that the average user of the furnace-brazing process is content with the strength obtained with a very short soaking time following the melting and flowing of the brazing metal. Probably this period does not exceed from 1 to 4 min. for the average job. In other words, the average job probably stops where the curve Fig. 71 begins.

Effects of Heat Treatment

The effects of various subsequent heat treatments on the strength of copper-brazed joints in low-carbon steels used for carburizing (S.A.E. 1010 and S.A.E. 1112), were next investigated. The results charted in Fig. 73 indicate that all heat treatments de-

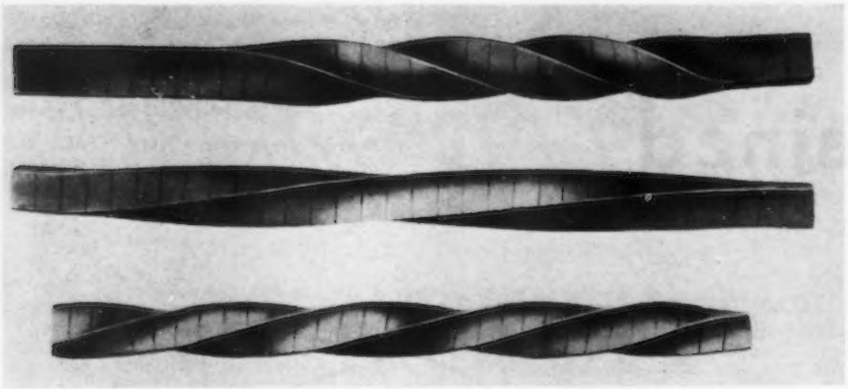

FIG. 72—The strength and ductility of furnace-brazed joints are demonstrated by these test bars which are made up of a series of ½-in. square by ¼-in. thick steel blocks copper brazed together. The bars were twisted 360, 180 and 360 deg. respectively, reading from top to bottom. The bonds had sufficient strength to resist the tendency to shear.

tract somewhat from the strength of the joints. Also that in general the more drastic the treatment the greater the reduction in strength. For instance cyanide was the poorest medium in which to heat the parts, and the water quench was less desirable than the oil quench, from the standpoint of strength of the bonds. A wide variation in strength of individual samples in each lot is quite noticeable. However, the lot given the 700 deg. F draw showed comparatively good uniformity. It should be noted that although some of the values in the chart suffer by comparison with the others, even the minimum strengths are considerably above those obtained with the former methods of making joints in cash-register sub-assemblies by feather pinning, spot welding, torch brazing, etc.

Another series of tests was made to determine the strength of copper-brazed joints in alloy and higher-carbon steels compared with those in low-carbon steels employed for the foregoing tests. Fig. 74 shows the results obtained on copper-brazed samples prepared as before, using five different kinds of steel, heating in a box-type furnace and quenching in either water or oil as indicated. The strength of these joints is comparatively high and uniformity is relatively good when comparing with the heat-treated low-carbon steel samples. It will be observed that the best values of strength were obtained with S.A.E. 4615 nickel-molybdenum steel.

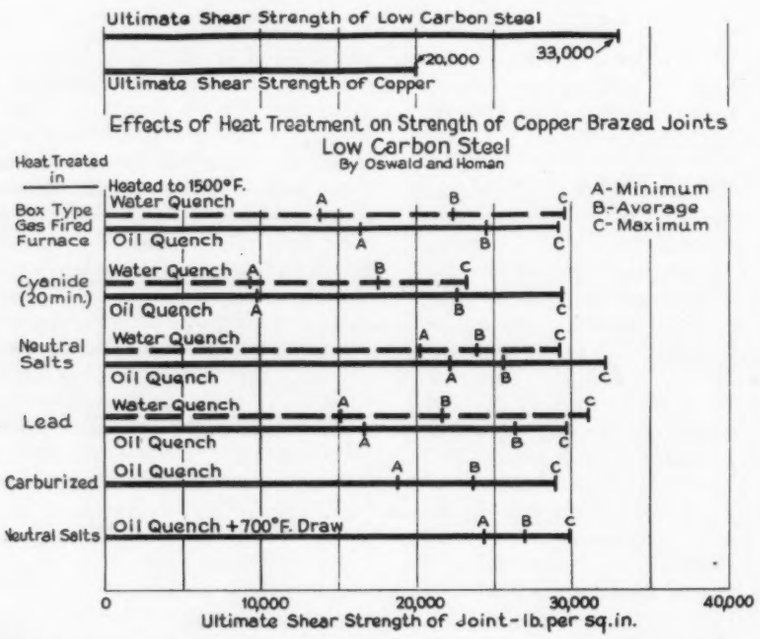

FIG. 73—The more severe the heating and quenching mediums, the less the strength obtainable in heat-treated copper-brazed joints. However, even the minimum values shown here give stronger cash-register sub-assemblies than those formerly made by other methods.

Grain Refined by Reheating

When brazing steel with copper there is some enlargement of grain size, due to the high temperature treatment. For most applications this is not objectionable. There are cases, however, in which it is desirable to have a fine grain structure. Reheating through the critical range, using either a regular normalizing or hardening cycle, or both, generally will refine the grain.

That this can be done is shown by the four photomicrographs of S.A.E. 4130 chrome-molybdenum steel in Fig. 75. At the upper left is a sample in the annealed "as received" condition. At the upper right is the same steel after passing through a mesh-belt copper brazing furnace. It moved continuously through the heating chamber in 12 min., the maximum temperature being 2060 deg. F. (1125 deg. C.). At the lower right is the copper brazed sample after being normalized, hardened and drawn; note how the grain has been refined. At the lower left is shown the heat treated condition of the "as received" sample. It is interesting to observe that substantially the same ultimate structure is obtained after heat treatment, regardless of whether the steel has been subjected to a short-time copper brazing treatment.

Parts which have been work hardened in processing will, of course, lose much of their stiffness in the electric-furnace brazing process, because of the annealing effect of the treatment. In general, however, this annealing effect is desirable.

Carburizing Before or After Brazing

Parts can be carburized either before or after the copper-brazing operation. If carburized before furnace brazing, or if they are made of high-carbon steel, precautions are generally taken to minimize or prevent surface decarburization. A protective electroplate of copper will reduce the decarburization materially, but this cannot be counted up to completely prevent decarburization. Reduction or removal of moisture and carbon dioxide in the gases supplied to the furnace atmosphere is also helpful because these constituents are active decarburizers. Enriching the gases with hydrocarbons is sometimes helpful.

The copper-plating scheme has been

used with success on carburized subassemblies being copper brazed in production. It is desirable to carburize with a fairly heavy case with high concentration, in order to compensate for some loss of carbon by diffusion into the core and for any remaining tendency for the furnace atmosphere to decarburize the surface. By carburizing to a depth of 0.030 in. with a concentration of about 1.2 per cent carbon, and by plating with 0.0005 in. of copper, drying the gas, and keeping the CO_2 low, manufacturers are able to get file-hard surfaces on copper-brazed assemblies where the brazing time does not exceed about 15 min.

It is possible to copper braze unplated parts resulting in very little or no surface decarburization if the gases

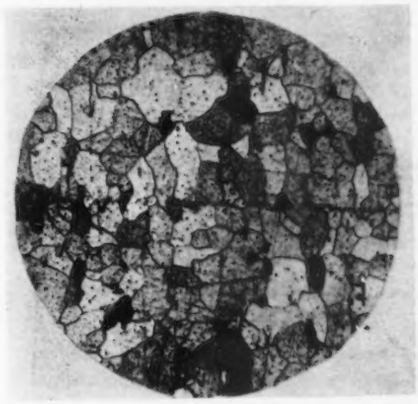

FIG. 76—Steel surfaces which have grown together, under pressure and at a temperature of 2100 deg. F. are shown in this photomicrograph. They were not copper brazed. The joint is still in evidence.

are completely freed of H_2O and CO_2 such as by passing them through an activated-alumina or silica-gel dryer and through a CO_2 remover, assuming the furnace is tight enough to minimize infiltering air and that it is purged long enough at the start to remove entrapped air and moisture.

Dried gases with low CO_2, enriched with hydrocarbons, give reasonably good results on unplated parts with respect to decarburization. With this system caution is necessary to avoid accumulation of carbon within the furnace from cracked hydrocarbons which could short circuit and burn out the heating elements.

Why Such High Strength is Obtained

It has been demonstrated repeatedly that the bonds made by electric-furnace brazing have great strength. The evidence given here is only a small

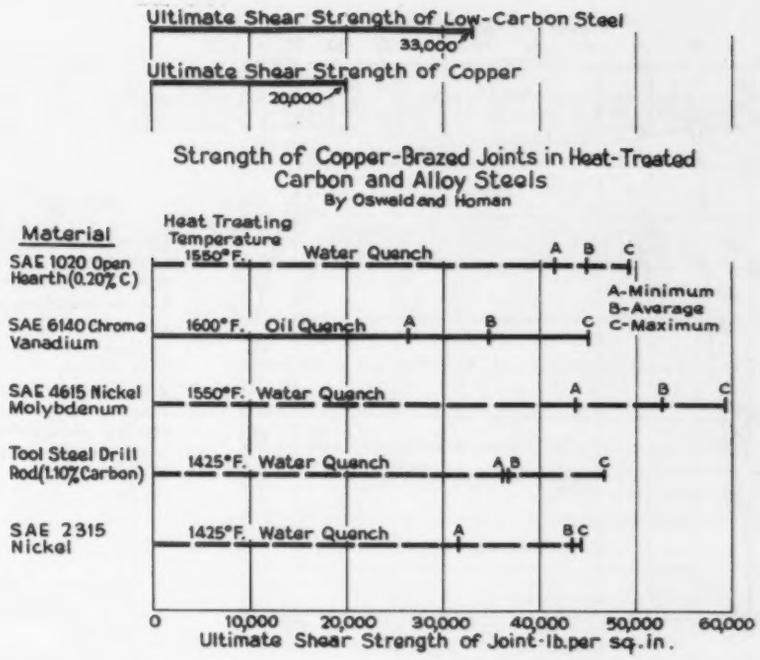

FIG. 74—Carbon and alloy steels, copper brazed and heat treated, show good strength in the brazed joints. Ultimate shear-strength values for joints in five different grades of steel are shown here.

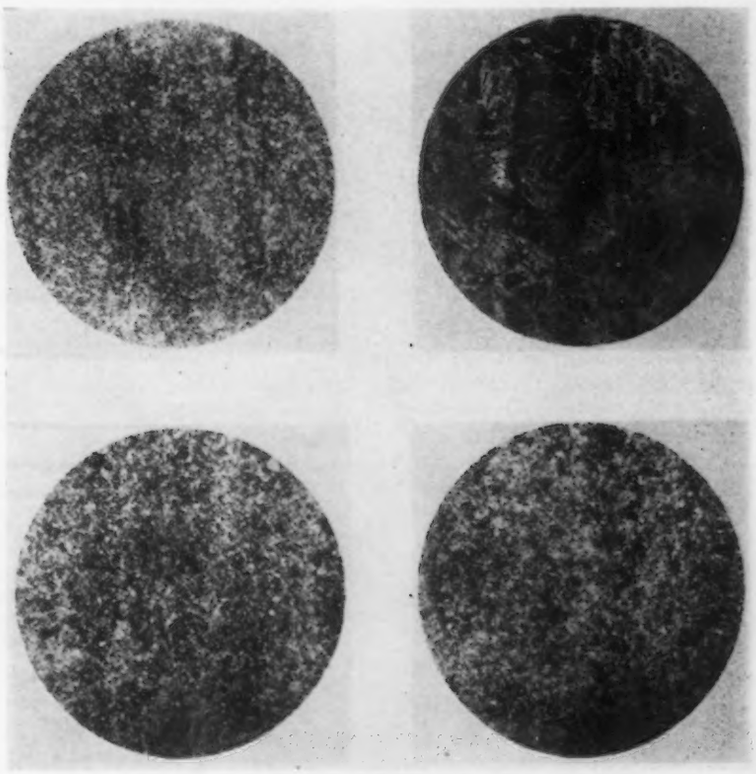

FIG. 75—Effects of electric-furnace brazing and heat treating S.A.E. 4130 chrome molybdenum steel are shown in these photomicrographs. ***Upper left:*** Sample in as-received condition. ***Upper right:*** Sample copper brazed at 2060 deg. F. in 12 min. ***Lower right:*** Preceding sample heat treated, showing refinement of grain. Normalizing treatment: Heated 1700 deg. F., 30 min.; air quenched. Hardening treatment: Heated 1550 deg. F. 15 min.; water quenched. Draw: Heated 1200 deg. F. 1 hr. ***Lower left:*** As-received sample heat treated. Normalized, hardened and drawn by same treatment given sample at lower right.

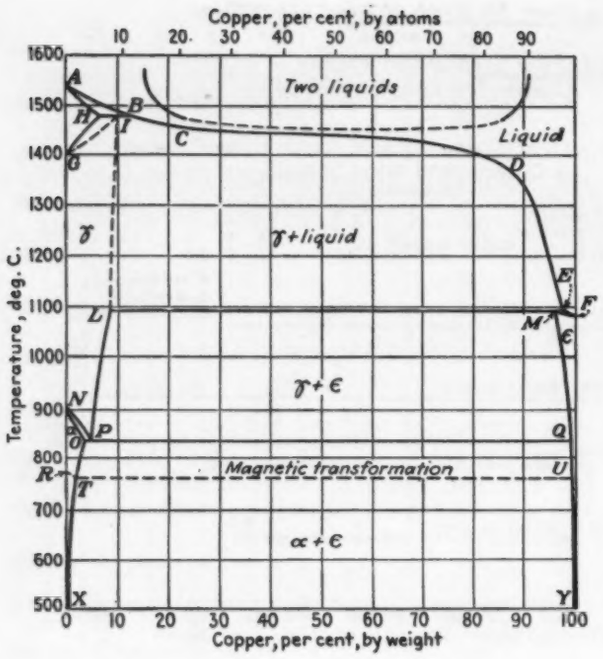

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FIG. 77—Equilibrium diagram of the iron-copper system as proposed by Gregg and Daniloff in their monograph, "The Alloys of Iron and Copper" published for the Engineering Foundation by the McGraw-Hill Publishing Co.

portion of that available. Considerably more work will undoubtedly be done in the future by various investigators, particularly to obtain comparative-strength data for different brazing metals, and to determine the best conditions for their use.

Plausible explanations have been offered to justify the great strength of furnace-brazed joints, which center on two well-known phenomena—a knitting or growing together of the parent metals when in intimate contact within the joints, and the formation of alloys by the brazing metal and the parent metal.

To illustrate this first effect—knitting or "grain growth" between the parent metals, Messrs. Oswald and Homan put another set of 10 samples through the brazing furnace without any copper at all, the material being low-carbon steel. Each of the samples was pressed together with such force that it would take 1500-3000 lb. per sq. in. (shear stress in the joint) to separate it. Following the copper brazing cycle, with no brazing metal used, the average strength was 18,900 lb. per sq. in. within the joints—an increase of over eight times the original strength, caused simply by the steel grains in intimate contact within the joints growing together. From this it follows that the grain growth is a desirable effect in the furnace-brazing process, and to encourage it the assemblies should be put together with snug fits.

That this grain growth takes place across the joints, even without the presence of brazing metal, is further shown in the photomicrograph Fig. 76. This illustration shows a cross-section of a joint which has grown together between two blocks of steel that have been passed through a long copper-brazing cycle. Pressure of about 100 lb. per sq. in. has been exerted upon the joint to assist the grain growth. In the photomicrograph it will be noticed that the joint has entirely disappeared in some places where the grains have grown across. In fact, the picture was taken at a point in the sample where the joint was still

(CONTINUED ON PAGE 61)

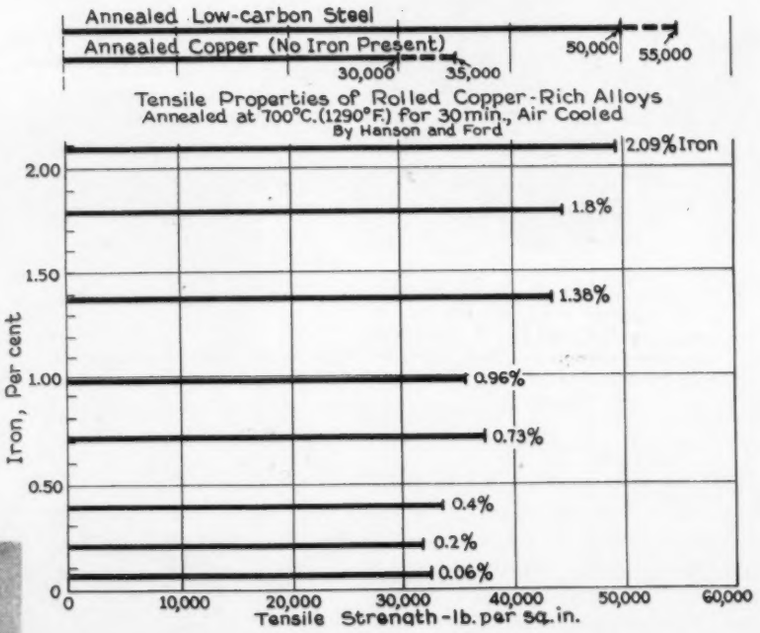

FIG. 79—This chart shows how the tensile strength of copper increases with slight additions of iron, and (top) gives a direct comparison of these copper-iron alloys with the tensile strength of annealed low-carbon steel and annealed copper.

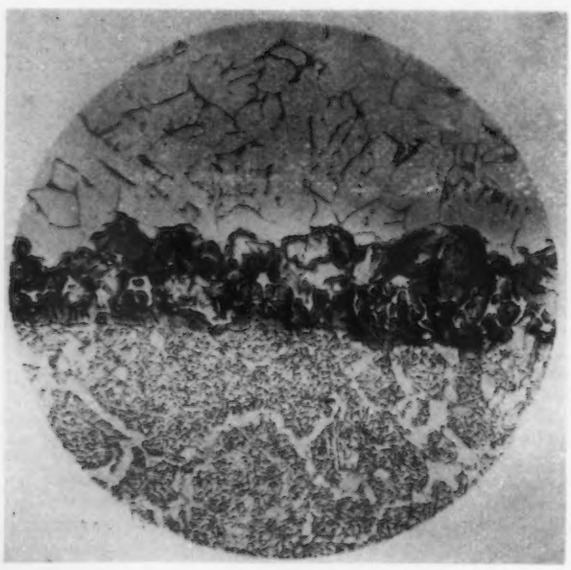

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FIG. 78—Photomicrograph of a copper-brazed joint between two pieces of steel of slightly different analyses. The combination of copper penetrating along the grain boundaries on the sides of the joint and the growing together of the grains has practically knitted the two surfaces together.

Improvements Continue in Finishing Equipment, Cleaners and Finishes

TYPICAL of the special types of automatic polishing and buffing equipment being furnished the automotive industry is the type HD Strait Line machine designed by the *Hammond Machinery Builders* of Kalamazoo, Mich., for finishing running board molding. The unit pictured is 42 ft. in overall length and has 12 heads, each powered by a 7½-hp. motor. This model can be had, however, with any desired number of heads, and the ways can be made shorter or longer. Wheel heads are balanced to insure uniform wheel pressure and are adjustable from horizontal to vertical position. Each motor is separately controlled, but a single safety switch will stop all motors and the platen drive.

The cast iron platens are mounted on ball bearings and travel over steel ways. They are connected to a heavy conveyor chain driven through a Reeves variable speed unit. All moving parts are protected from abrasive matter. The motor spindles are mounted in anti-friction sealed bearings.

Power Driven Hand Sanders

A NEW type of portable electric sanding machine is announced by *Sterling Products Co.*, Detroit. The movement of the sanding pad on this electric Gyro sander causes each abrasive particle to move in a centroid of about 5/16 in., simulating hand sanding, and according to the maker giving high cutting speed, uniform finish and the absence of chasing and graining effects. Power is transmitted to the light weight sander head (3¼ lb.) through a flexible shaft from a ¼-hp. motor operating at 3450 r.p.m. Three different types of motor mountings are provided: bench plate type for work bench; ceiling suspended or overhead trolley type; or an adjustable height pedestal model with caster base. From one to five abrasive sheets

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By FRANK J. OLIVER
Associate Editor, The Iron Age

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may be attached to the sanding pad at one loading.

ANOTHER type of portable power driven sander is the Electro model with built-in motor, made by *Chicago Tool & Kit Mfg. Co.*, 116 East 33rd Street, Chicago. It embodies the principle of an eccentric drive, but so constrained that the abrasive paper moves back and forth in a straight line. There are two models: model A weighs about 7 lb. and takes a third sheet of sandpaper; model B weighs about 11½ lb. and takes a half sheet. The base of either is covered with sponge rubber to enable the operator to work on curved and irregular surfaces. A flexible enclosure between motor housing and reciprocating pate is made of neoprene, du Pont's chloroprene rubber that resists the deteriorating action of oils. This machine operates from a light socket and can be used for a wide variety of finishing jobs. Made in both a.c. and d.c. motor types.

FULLY automatic buffing and polishing machines have been developed for the automotive industry and two innovations in portable power driven sanders have been put on the market in recent months. A conveyorized solvent degreaser that loads and unloads at the same end has been announced and a number of cleaning compounds have been recently introduced. Miscellaneous items for the finisher include a fast dryer for small plated parts, nozzle extensions for auto body sealer work, air-operated agitators for paints and lacquers, a metal spray gun built around a gasoline blow torch, and an improved instrument for measuring the thickness of porcelain enamel, paints and lacquers on flat or curved work. Several one-coat finishes have also been recently announced.

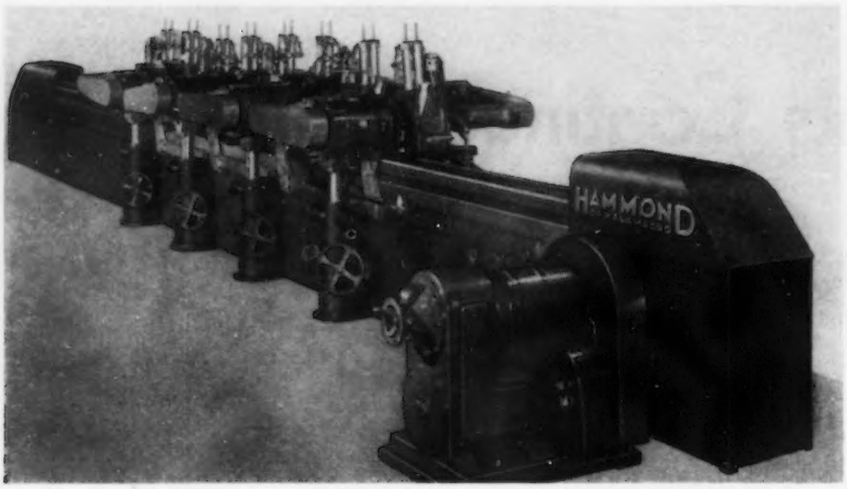
Conveyorized Degreaser

A THREE-DIP Detrex degreaser has been designed by the *Detroit Rex Products Co.*, Detroit, with a return type crossrod conveyor arranged to load and unload at one end, the return flight of conveyor being in the upper hood. The sequence of cleaning operations for a basket of work is immersion in boiling solvent, immersion in clean solvent rinse and final cleaning and drying in pure solvent vapors of either Perm-A-Clor or Triad. The particular size pictured accommodates work up to 36 in. long by 15 in. wide by 15 in. deep. At a normal conveyor speed of 6 ft. per min., cleaning capacity is 2000 lb. of work per hr. Conveyor drive is from a ¾-hp. motor through a variable-speed unit.

The degreaser is fabricated from steel plate, hot zinc spray coated on the inside after being assembled by welding. As in other Detrex types, a water jacket condenser encircles the machine. The condensate is collected in troughs and is returned to the rinse chamber, which in turn overflows into the third or vapor chamber. Steam coils are used to boil the solvent.

Cleaning Compounds

THE principles of soap washing and solvent cleaning are said to be combined in the Magnus vapor cleaner, made by the *Magnus Chemical Co., Inc.*, Garwood, N. J. This new product is offered in two grades: Magnus 92-E, for light duty cleaning and 94-E for heavy duty cleaning. Both are light brown pastes, readily soluble in water. They impart to the water a wetting, penetrative and solvent effect said to be beyond that of



ABOVE

THE Hammond type HD Strait Line automatic polishing and buffing machine was designed for finishing running board molding.

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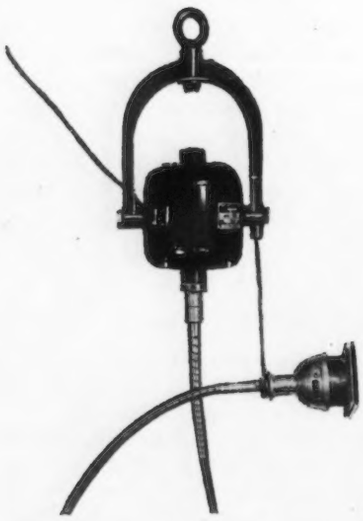
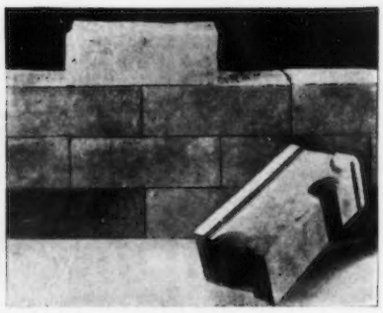


THE Sterling electric Gyro sander is a flexible shaft driven unit that causes every abrasive particle to travel in a centroid of approximately 5/16 in., producing high cutting speed and uniform finish.

BELOW

THE Electro sander made by the Chicago Tool & Kit Mfg. Co., operates on the eccentric principle, but the sander pad is so controlled as to reciprocate in a straight line.



ABOVE

A PATENT has recently been granted to the Sauereisen Cements Co., Sharpsburg, Pa., for its Pour-Lay design of acid proof brick, used for lining pickling baths and the like. Design includes pouring cavities so arranged as to allow the brick to be laid dry in such a way as to present a smooth surface without joints. A molten sulphur or asphaltic joint compound is used for sealing. Manufacturing rights will be licensed to brick producers.

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ESPECIALLY desirable for large bulky work where extra space around the wheel is at a premium is the new type O Hammond combination grinder and polisher. The top section overhangs 12½ in. from the lower front of the base. Spindle is 52 in. long. Standard equipment includes combination switch and brake enabling the operator to stop the spindle almost instantly; spindle lock for changing wheels; and automatic motor starter with overload and low-voltage protection. The motor in the base drives the spindle by V-belt.

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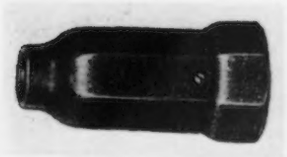
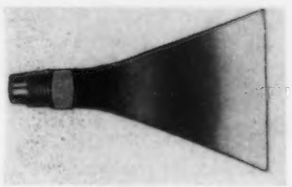
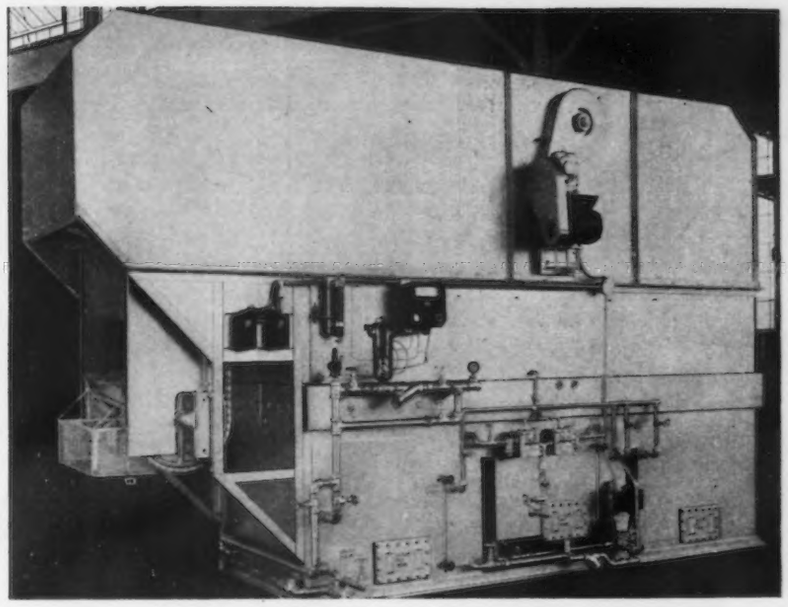
PNEUMIX type B air-motor operated agitator is designed to mix inflammable organic compounds and solvents in batches up to 100 gal. Another type made by the Eclipse Air Brush Co., Inc., is also described in the text.

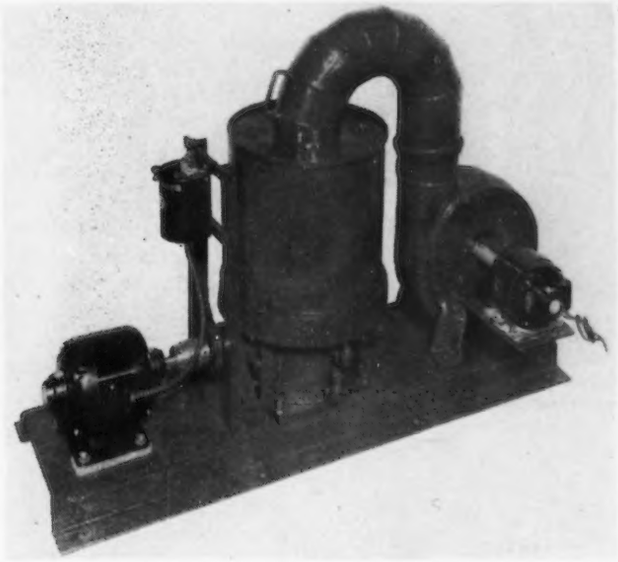




SPRAYING Systems Co., 4922 W. Grand Avenue, Chicago, is offering two new types of spray nozzles suitable for industrial washers, chemical processes, gas washing or cooling. Fulljet nozzles (upper) are made in sizes from 1/8 to 3 in. and in capacities from 0.5 to 120 gal. per min. at 10 lb. pressure. Flatjet spray nozzles (lower) are made in sizes from 1/4 to 3/4 in. and in capacities from 1 to 20 g.p.m. at 40 lb.



AUTOMATIC three-dip type Detrex degreaser equipped with cross-rod conveyor, automatic controls and arranged for loading and unloading at one end.

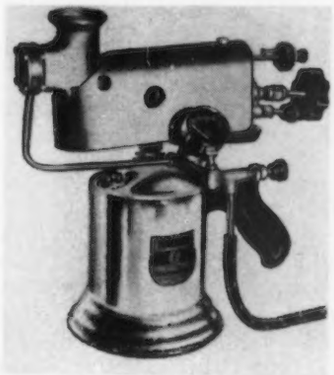


ABOVE

A BATCH of 30 to 60 lb. of small work can be dried in 1 to 2 min. in the improved Mercil type centrifugal dryer, made by Hanson-Van Winkle-Munning Co., Matawan, N. J. The new construction includes a Garden City blower, direct driven by a 1/4-hp. motor, and connected to the cover by a 6-in. pipe. Electric heating elements are inserted in the pipe line directly above the opening in the cover. When loading, the cover is simply swung out of the way. Absence of vibration is claimed when the dryer is rotating loaded at 600 r.p.m.

EXTENSION nozzles of 4 to 10 in. in length are available for the Thor model 7-H spray gun, made by Binks Mfg. Co., Chicago, so as to adapt it for applying sealer to body seams on the under side of automobile bodies and other inaccessible places. Material inlet is 3/4 in. and air inlet 3/8 in.

THE G-E thickness gage is an improved type for the accurate measurement of thicknesses of non-magnetic coatings, such as enamels and lacquers, on iron or steel products.



AT LEFT

THE Turner metal spray gun for lead-tin alloys is built around a modified gasoline blow torch.

AT RIGHT

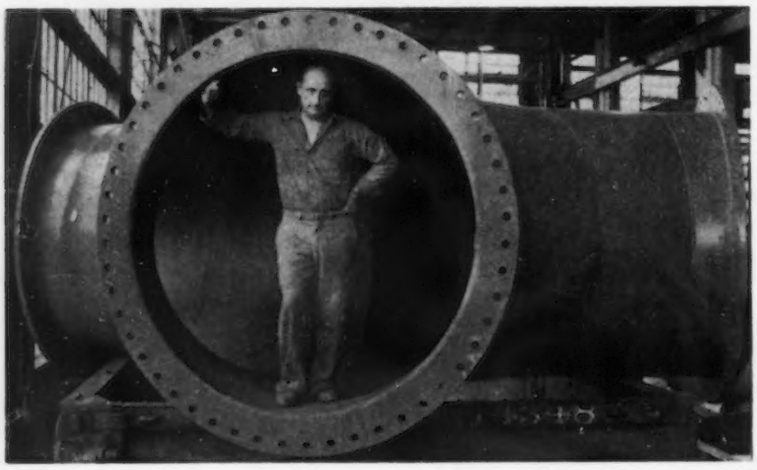
SAMPLE of the new Silverflake finish for heaters developed by the Lusterlite Laboratories of Chicago Vitreous Enamel Product Co. The application is shown for steel, but the material is also suitable for cast iron.

any soap or alkali. The compounds can be used in any type of steam or vapor cleaning machine, such as the Hy-Pressure Jenny, recently described in these pages.

ANOTHER type of water soluble cleaner is Quaker TF-936, made by the *Quaker Chemical Products Corp.*, Conshohocken, Pa. The material is in the form of a clear, claret-colored hydrocarbon oil that has the ability to remove all types of fats and soaps, in addition to the mineral oils used in cutting fluids and in quenching. It may be used in the processing of metals prior to painting, japanning, parkerizing, bonderizing and similar finishing operations. It is said to produce a freely rinsed, clean surface, thereby insuring an adequate bond between the material and the finishing work. Quaker TF-936 may be used in either soak tanks or washing machines, preferably the latter to remove combinations of materials. A slight film is left on the work after cleaning and this is sufficient to prevent rusting of work in transit through the plant or for short stocking periods.

PEMCO cleaner is being furnished by the *Porcelain Enamel & Mfg. Co.*, Baltimore, for cleaning most vegetable and mineral oils from sheet steel commonly used for stamping and drawing operations. Its action is one of saponifying and emulsifying. All the components are soluble in warm water, assuring freedom from any adhesive, free-floating particles in the cleaner bath. The material is shipped in serviceable steel drums, each of which contains a package of starter which makes a new batch efficient immediately.

A NEW gas process is being used for cleaning the oil off of wire cloth prior to electrogalvanizing. Using small gas-fired ovens with heat traveling counterflow to the wire cloth, several manufacturers are successfully cleaning wire cloth 30 to 48 in. wide, of 12 to 16 mesh. The cloth passes over rollers for three horizontal passes in the oven, with air seal at vertical feed and delivery legs. Temperature is 750 deg. F., with a gas consumption of 0.62 therm per hr. After heating, the wire is a uniform dark purple color and is passed directly into the plating tank after passing through a stream of air to remove any dust remaining on the wire.



SPECIAL Y-branch of a length of over 100 ft. of rubber lined pipe ranging from 42 to 72 in. in diameter which will be used to handle chemicals extracted from sea water. The 3/16-in. thick Vulcalock hard rubber lining, made by the B. F. Goodrich Co., will handle chlorinated and acidified water at 30 deg. C.

TWO new special metal cleaning compounds have been announced by the *Nielco Chemical Co.*, 5411 Cicotte Avenue, Detroit. Galvo-Cleen is for use in cleaning and preparing for painting new and old galvanized metal and zinc die castings. The material forms a non-reactive zinc phosphate coating to which paint is said readily to adhere. Rust-Solv is a semi-paste rust solvent that can be applied with a spray or a brush. It dissolves normal deposit of rust fast, yet it is said to remain moist and active long enough to dissolve heavy deposits of rust in one application. It will not, however, remove scale. This compound can be used on any metal surface, including chromium plated work, brass, copper and porcelain.

A COMPOUND that facilitates the cleaning of spray booths, thereby reducing the fire hazard and the marring of finished work by dirt spots, has been developed by *Maas & Waldstein Co.*, Newark, N. J. All exposed surfaces of the booth are covered with the compound, which is a non-hardening, but non-oily paste, applied with a brush. The residues from sprayed paint and lacquer are deposited on the compound, which can be readily removed with a putty knife from time to time.

Air-Operated Agitators

THE *Eclipse Air Brush Co.*, 390 Park Avenue, Newark, N. J., has developed two new models of air-operated agitators for paints and lacquers. Pneumix type B, illustrated, is designed to handle batches of material up to 100 gal. Speed is variable, from 30 to 6000 r.p.m., requiring from 5 to 50 lb. air pressure. A muffler is installed in the exhaust line to assure quiet operation. Splash-proof performance has been provided by having the two propeller blades throw toward each other. The upper propeller is removable. The shaft, also removable, is available in chromium plated steel, stainless steel or bronze. The blades are chromium plated brass or stainless steel.

Pneumix type D is a heavier model, with the air motor driving through a 40:1 gear reducer for greater power in handling viscous materials. The motor and gear assembly is detachably mounted on a spider platform, adjustable to diameters from 12 to 26 in. to fit any container from a 5 to 55-gal. drum. Shaft is from 12 to 27 in. long, of chromium plated steel. The bronze propeller blades are also chromium plated and are furnished in two types: 8-in. turbo, or 10-in. airplane style. In both these agitators, the non-sparking safety feature is stressed by the maker.

Metal Spray Gun

ANY standard rods or bars of solder may be used in the Turner metal spray gun for lead-tin alloys, recently announced by the *Turner Brass Works*, Sycamore, Ill. A unique feature is that the heat is furnished by a modified blow-torch operating on gasoline. Low air pressure and volume is required. Instantaneous control of spray from fine to coarse is possible. Such an outfit sells for $42.50, and can

be used for applying protective coatings, covering non-metallic objects for plating and oxidizing, decorative and art work, and built-up model work.

Coating-Thickness Gage

AN improved type of thickness gage for non-magnetic coatings on steel, such as porcelain enamel, paints, lacquers and varnishes, is announced by *General Electric Co.* The new type utilizes a spool-like steel head, the two flanges of which both make contact and assure accurate measurement on curved as well as on plane surfaces. The individual readings of the two contact disks are automatically averaged. The new gage can measure with reasonable accuracy the thickness of a coating, such as lacquer, as thin as 0.0001 in., if the coating has been applied to a steel sheet 0.007 in. or more in thickness. With coating thicknesses of 0.005 or greater, the unit is accurate to 2 per cent. If it is desired to measure the thicknesses of such materials as paper and celluloid, sheets can be fitted to an iron or steel plate for accurate readings. Since the gage circuit has been chosen so that the scale is spread out at the low points, accuracy of readings at such points is comparably improved.

Stop-Off Lacquers

THE *Michigan Chrome Co.*, 6340 E. Jefferson Avenue, Detroit. has recently developed two new types of stop-off lacquers for insulating plating racks for decorating plating and for masking parts to be hard chromium plated. These lacquers are applied directly on the metal surface after a thorough cleaning. Tests conducted over prolonged periods with alkaline cleaner at 212 deg. F., such as found in continuous systems, showed the coating on plating racks to be still effective after 500 hr. of continuous immersion. Other processes in which these lacquers have proved effective are concentrated or diluted hydrochloric acid or sulphuric acid dips, cyanide or acid copper baths and chromic acid baths. They are said to be equally impervious to nitric or hydrofluoric acids and have proved satisfactory for use with degreasing units.

In use with hard chromium plating processes, the lacquers, while offering adequate adhesion, can be removed easily after plating. They possess rapid air drying qualities. As edges can be trimmed easily and excess lacquer can be quickly removed with a thinner, they lend themselves to accurate plating work. As the material is absolutely neutral, there is no possibility of etching in machined parts that have been precision lapped.

One-Fire Porcelain Enamel Finish

SILVERFLAKE is the name given a new one-coat porcelain enamel finish developed for application to space heaters by the *Chicago Vitreous Enamel Products Co.*, Cicero, Ill., to be competitive to organic "crackle" finishes. Ordinarily, a porcelain enamel finish requires a ground coat, followed by one or two cover coats, each requiring a separate firing in a high temperature furnace. Silverflake is merely a ground coat oversprayed with a silverflake liquid, giving a finish of dark background, forming a contrast with the bright flakes. The material can be applied equally well to cast iron or steel, and is immune to discoloration, heat corrosion and absorption.

THE *Porcelain Enamel & Mfg. Co.*, Baltimore, recently developed a new deopacifying agent, known as Pemco Unifier. It will correct the color of second and third coat porcelain enamel, thereby giving a perfect match in reworks, free of a specky finish.

A PORCELAIN-LIKE, short-bake synthetic enamel, known as Vitra-Carlite, has been announced by the *Hilo Varnish Corp.*, 42 Stewart Avenue, Brooklyn. It is said to cover excellently in one coat, laying on with a smooth film. Has chemical resistance, especially to solvents, oils and greases. It may be used for brush, spray, dip or tumble.

Another one-coat finish made by the *Hilo Varnish Corp.* is the metallic Rip-pl, which gives an attractive wave line effect and a metallic sheen in one coat. Copper, aluminum, brass, gold, silver gray and brighter gold powder or paste is mixed with the metallic Rip-pl vehicle just before it is applied to obtain the various metal effects.

Resistance Welding of Dissimilar Metals

RESISTANCE welding of dissimilar metals was discussed by Dr. F. R. Hensel, consulting engineer, for P. R. Mallory & Co., Inc., Indianapolis, at a meeting of the Detroit section of the American Welding Society, held Dec. 16 . Dr. Hensel presented extensive data correlating metallurgical and tensile properties of resistance welds produced with dissimilar material. He referred particularly to the spot welding of 18-8 stainless steel to yellow brass, speaking from a paper prepared jointly with E. I. Larsen and E. F. Holt.

In earlier attempts to produce such welds, strength probably was not very important in many cases, Dr. Hensel declared, adding that as long as the materials stuck together fairly well, the weld was considered satisfactory.

"Resistance welding of dissimilar metals, alloy formations by direct melting or by diffusion of two dissimilar metals may produce new metallurgical phases such as eutectics, solid solutions or intermetallic compounds. A great deal of research is needed to shed light on this multitude of problems because the number of combinations that are possible goes into the hundreds," he said. "When welding dissimilar metals, the selection of the electrode material plays an outstanding part in order to obtain the necessary quality of weld."

Experimental data presented showed the necessity of varying electrode design to obtain best results. It was stated that before welding stainless steel it is particularly important to buff the material, since the use of steel wool buffing in test cases resulted in welds of increased strength and consistency. The series of tests which he reported made use of water-cooled electrodes of two different materials, Mallory 3 Metal and Elkonite Grade 10W3. The first is a heat treatable copper base alloy, the second is basically copper-tungsten.

Dr. Hensel's report included the study of ratio of width to thickness of spot welds under various conditions. Through drawings and a set of photomicrographs he illustrated the results of welding stainless steel and brass.

Book on Grinding Wheels

A HANDBOOK on modern grinding and polishing practice and theory, by Johnson Heywood, has been published under the auspices of the Grinding Wheel Manufacturers Association and the Abrasive Grain Association. Under the title, "Grinding Wheels and Their Uses," the book is available from the Penton Publishing Co., Cleveland, at $3 a copy. The book contains 374 6 x 9-in. pages and is illustrated.

THIS WEEK ON THE ASSEMBLY LINE

o o o

By W. F. SHERMAN
Detroit Editor

o o o

. . . Four-day work-week asked by UAW cuts auto production 10 per cent . . . Plans for new car and engines being pushed forward . . . Ford makes plans for housing project near Rotunda.

DETROIT. — More widespread adoption of the 32-hr. work-week, believed to be temporary, had the effect of reducing automobile production about 10 per cent last week. This sets a new, somewhat retarded, pace for the industry to follow. It has led to a revision of previous estimates of January production, with the possibility that it will be in the range of 325,000 to 350,000 units.

The total for the last week, according to Ward's Automotive Reports, was 92,890 passenger cars and trucks in the United States and Canada, compared with 102,905 the previous week and 67,230 a year ago.

Ford and Mercury production continued to gain, reaching 21,400, while Lincoln and Lincoln-Zephyr output totaled 800, following Ford's announcement of still another increase in Lincoln-Zephyr production schedules. Dealers' requirements of Lincoln-Zephyrs for January delivery are equal to their November and December requirements. Ford promises to be the outstanding bright spot through the next year. Suppliers are being pushed to bring up their schedules to meet the constantly increasing Ford demand.

Chevrolet felt further effects of the 32-hr. work-week which was introduced a week ago; production dropped from 25,500 to 22,900. Plymouth slid from 13,900 to 10,840 when Chrysler management unexpectedly followed the example set in Flint plants, announcing a four-day schedule.

No Explanation of Concession

Spokesmen for the automobile industry are saying nothing in explanation of the sudden concession of the 32-hr. week demanded by the unions. Inquiries are being greeted with the suggestion "Draw your own conclusions." However, management in other industries afar from Detroit need feel little fear that the four-day work-week is here to stay. The unions asked for it with the explanation that it would put back to work thousands of UAW members who were losing their seniority status insofar as defined in current UAW contracts. Union leaders thought that the demand was a good weapon to swing, but failed to consider that the normal seasonal decline in demand for autos might make it perfectly acceptable anyhow to the manufacturers. It has provided an easy way to stabilize operations until the spring pickup.

Immediate results insofar as production is concerned will be to trim the weekly assembly figure for complete automobiles sharply below the 100,000 mark with 80,000 to 90,000 as the probable new level. However, there actually has been an acceleration of production (not assembly) lines. Particularly in the case of Ford, production will be stepped up sharply shortly after the first of the year. The Rouge plant will accelerate output of engines and various sub-assemblies even to the point of hiring a larger working force. As already stated, suppliers are now feeling effects of pressure to bring this about. It must be conceded, however, that in the last few days there has been considerable reduction of schedules for suppliers delivering to many of the other automobile companies. Evaluating all of the known facts as carefully as possible, the outlook right now is:

Car assemblies—down.

Parts production and sub-assemblies —up in some cases.

Willys-Overland Sales Up

During last week the Willys-Overland plant closed several departments after only three days of work to permit balancing inventories and other adjustments for the new year. However, this company has found December sales many times better than they were a year ago, in the first 10 days of the month disposing of more cars and trucks than were sold in the entire month of December, 1937. Production at the Toledo plant has been near capacity and it is reported that the assembly plant in Los Angeles is in full operation.

The outlook for next spring is bright enough to encourage Packard to go ahead with plans for the light six which Alvan Macauley, president, mentioned last fall (Assembly Line Sept. 29, 1938). Some parts have been released for prices but inquiries offer

. . . back in 1922

we went into production on ground thread taps. For some time before that we had experimented and tested until we were sure we had a tap worthy of being stamped Pratt & Whitney. It was more than just a good tap. It was the best that 1922 knowledge could produce. Not until we were sure of our product would we offer a Pratt & Whitney ground thread tap to our customers.

Tops in Taps

NOW . . . in 1939

PRATT & WHITNEY ground thread taps still are the best that our greatly improved knowledge can produce. Every new advance in metallurgy has contributed to Pratt & Whitney tap toughness and long life. Better grinding methods and machines of our own design have improved the accurate finish and lowered manufacturing costs.

There are two principal things to consider when you buy taps. First you need the type or design that will do your particular job most efficiently. Pratt & Whitney representatives can help you there because they are experts trained to know what works best. Second you must select the correct size you need to produce threads within correct limits for either a Class 1, 2, 3 or 4 fit. Pratt & Whitney Ground Thread Taps are made to meet just this situation. All you have to do is show your problem to a Pratt & Whitney tap man and he can tell you the exact tap to use for smooth, trouble-free results.

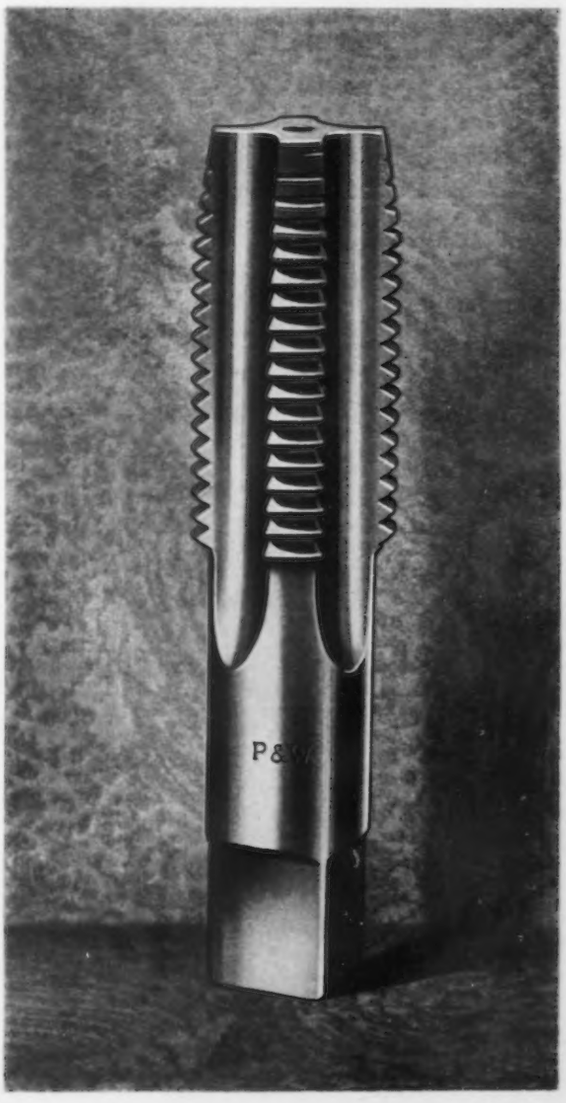
Try it. Put your tapping worries on our shoulders. We will give you real tap service at the lowest cost per tapped hole—the only true way to buy. And, remember—Pratt & Whitney means "Tops in Taps."

● ● ● ● ●

Pratt & Whitney

DIVISION NILES-BEMENT-POND CO.

HARTFORD, CONNECTICUT



no clue as to how soon the new car may be introduced to the public.

This is the season of much conversation about new models. It is easy to go off the deep end, however, and say that something is "here" when actually it may never see the light outside the engineering laboratory. Ford, as an example, today has at least eight different engines to which the engineering department is devoting its efforts. Included in the group is a four-cylinder engine similar to the one which was slated a year ago to go into the 95-in. wheelbase car. It is said again, as last spring, that it is for the tractor in which Henry Ford is personally interested.

At this stage this engine-testing activity indicates not a single thing about production plans. At most it is only a gage of the exhausive research and testing that goes into the product before it reaches the customer on wheels.

Ford's Housing Plans

Mr. Ford's personal interest in the housing program which he announced recently is indicated by the model village which has been laid out at his direction. Visitors have seen the automobile leader himself, on his knees placing miniature houses and school buildings at likely spots along the curving roads of this scale model subdivision, then standing back to observe the effects.

Mr. Ford isn't at all bashful about playing with blocks—when he is finished planning the new community, it will eventually provide modern homes for a population of 16,000. The tract of land, nearly two miles square, is north of South Dearborn Road, extends on the west to Southfield Superhighway and on the east almost to the Ford Rotunda property. The main line of the Michigan Central Railroad is along the north end of the property. The first unit of the property is bounded by Greenfield Road, Airport Drive and the River Rouge. This unit will house some 3000 persons.

If a low-priced automobile was built the way the average house is assembled, it probably would cost the buyer a good, round $15,000, the Automobile Manufacturers Association has recently estimated. Now we may see what happens when you turn the idea around and build an average house the way a low-priced automobile is built. No announcement has been made about the design of houses to be built under the Ford plan, but it is considered likely here that they will be frame structures, put up in the conventional style. However, innovations are to be expected.

Charles F. Kettering, General Motors vice-president in charge of research, gave the first of a series of lectures this week under sponsorship of the Detroit Engineering Society in the Institute of Arts Building. The lectures will follow a precedent established nearly 100 years ago by Michael Faraday in instituting a Christmas period of scientific talks. Kettering's talk, intended to be heard by high school science students, was augmented with demonstrations of recent developments in the GM research laboratories. His talk was scheduled for Wednesday night. On Friday, Dec. 30 at 2 p. m. and again at 8 p. m., the second lecture will be given by scientists from the Franklin Institute.

Automobile Notes

Automobile sales during pre-Christmas week showed indications of much improvement over previous years. Forest H. Akers, Dodge director of sales, commenting on the buoyant manner in which the automobile business reacted, declared that there were definite indications of "fair weather" ahead. * * * Dodge has added two seven-passenger models to its 1939 line. Instead of a 117-in. wheelbase, these cars, one a seven-passenger sedan, the other a limousine, have a wheelbase of 134 in. * * * Willys-Overland, with sales so far more than double those of 1937, reports current assets exceeding $3,000,000, in the ratio of 5.7 to 1 over current liabilities. * * * Gross sales of automobiles and trucks during the past fiscal year ended June 30 declined $406,000,000 to a total of $993,182,280, accounting for more than half of the total drop of nearly $800,000,000 in all sales in Michigan, it is revealed by State records on sales tax collection. * * * However, taxes on these sales brought the State $4,753,996 and, in addition, filling stations paid $3,724,955, garages and repair shops paid $596,327 and sales of accessories brought in another $724,293. * * * As a whole, the industry paid sales taxes amounting to 19 per cent of the State's total, although the industry's sales were hit about twice as hard as general retail stocks.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

I AIN'T AFRAID TO SHOW THIS TO YOU GUYS NOW, BECAUSE I'VE APPLIED FER TH' PATENTS ON IT - BUT, BOYS, MY DAYS IN MACHINE SHOPS IS NEARLY OVER!
THAT'S A MODEL FER SHOOTING DOWN AIROPLANES AT NIGHT... YOU JUST TURN TH' SEARCHLIGHT ON A AIROPLANE AN' PULL TH' TRIGGER OF TH' CANNON AN' DOWN COMES TH' PLANE -- AS SIMPLE AS THAT!
YEH, BUT A SEARCHLIGHT GOES STRAIGHT AN' A BULLET OR SHELL ARCHES LIKE A ARROW ER THROWIN' A STONE... WE LIVE IN HOPE BUT HOPE KILLS US
COPR. 1938 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.
THE DREAMER
J.R. WILLIAMS 12-23

FTC Issues "Desist" Order To Wire-Wood Silo Makers

WASHINGTON.—The Federal Trade Commission has ordered seven manufacturers of combination wood and wire portable corn cribs and silos to discontinue alleged uniform price fixing by agreement in the sale of their products in ten Mid-Western states.

The respondents are Colon Rowe Mfg. Co., Galesburg, Ill.; Nebraska Bridge Supply & Lumber Co., Omaha; Mattson Wire & Mfg. Co., and Joseph M. and J. Wayne Denning, trading as Illinois Wire & Mfg. Co., Joliet, Ill.; E. S. Gaylor Lumber Co., Sioux City, Iowa; Humboldt Fence & Supply Co., Humboldt, Iowa, and Alexander G. Sutherland, trading as Kansas City Wire & Wire Works, Kansas City. In its statement the FTC said:

"The order directs that they cease and desist agreeing and combining to (1) fix and maintain uniform delivered prices, (2) defray, without additional cost to customers, carriage charges either for carload or less-than-carload lots, (3) allow one or more of the respondents to act as a clearing house for an exchange of views as to prices, (4) initiate uniform prices by any one or more of the respondents for any one or more states, (5) grant uniform discounts to customers, and (6) designate common basing points.

"The order also prohibits combination and agreement to (1) exchange delivered price lists, discounts and terms of sale, (2) make any or all delivered price changes effective simultaneously, (3) file revised price lists of any respondent with any other respondents after such revision, (4) exchange information regarding price cutting by producers, (5) request or urge distributors and dealers to report instances of price cutting, and (6) negotiate with producers charged with price cutting in an attempt to eliminate further price concessions."

Bridgeport Brass Plans Sales Meeting

BRIDGEPORT BRASS CO. representatives from 21 branch offices throughout the United States will be called to Bridgeport on January 9, for the first national convention to be held by the company in its 73-yr. history, Herman W. Steinkraus, vice-president in charge of sales of the company, has announced.

OUTSTANDING among the precision instruments of the world is the Sheffield Visual Gage. It has an enviable record for speed, accuracy and durability in the inspection department, out in the plant or in the laboratory. It has become the recognized standard among gaging authorities everywhere. And it is ALL-AMERICAN not only in performance, but in design, materials, manufacture and origin (Bell System patents).

When you buy Sheffield Visual Gages you are getting ALL-AMERICAN fast precision gaging equipment. Standardize on Sheffield Visual Gages for reliable production control.

SHEFFIELD
GAGE CORPORATION • DAYTON, OHIO, U.S.A.
MASTER GAGEMAKERS
NITRIGAGES

THIS WEEK IN WASHINGTON

. . . Court test of steel wage ruling likely as former union leader hears evidence for Labor Department . . . Further liberalization of Social Security Act to be issue . . . Abolition of payroll tax urged . . . ICC seeks rail maintenance estimates.

o o o

By L. W. MOFFETT

Resident Washington Editor
The Iron Age

o o o

WASHINGTON. — The possibility of a court test in the steel wage case loomed this week as Labor Department officials prepared to go ahead with an order making effective the Public Contract Board's steel wage recommendations calling for minimum rates of 62.5c. in 36 states in the North and 45c. in 12 states in the South.

Assistant Secretary of Labor McLaughlin, who heard almost two days of oral argument last week and who will sign the final steel wage order, was told by spokesmen for the steel industry that the board's recommendations legally were "out of bounds" and contrary to the intent of Congress when the law was framed.

It is understood that the labor Department has anticipated the possibility of court challenge in the case and for that reason scheduled the oral arguments of last week, a step described by officials as over and above the minimum requirements but a step believed necessary as an additional safeguard in the event its procedure is subsequently questioned in the courts.

A Labor Leader

Mr. McLaughlin, for 27 years a vice-president of the Brotherhood of Locomotive Firemen and Enginemen, was assigned to hear the oral arguments in the absence of Secretary Perkins with the understanding that he would also sign the final order. Any other procedure, it is understood, would have occasioned the same legal technicality raised by the Supreme Court in the Kansas City stockyard case in which the Department of Agriculture's procedure, involving an administrative order signed by the Secretary but which resulted from a hearing conducted by the Undersecretary, was criticized by the court.

The final order is expected to include a proviso which will permit small companies to petition for relief from the prescribed minima under Section 6 of the Public Contracts Act. The board took cognizance of the previous arguments presented by small companies and recommended that additional studies be made of their particular condition after the final order becomes effective. Steel executives and their counsel insist the so-called exemption section of the act is impractical.

Pivotal point in the oral arguments last week was the question of the board's authority to include 36 states in one "locality" and still be within the meaning of the law. Representatives of the industry contended that the board had gone beyond its assigned job, placing the legality of its recommendation in doubt. In substantiation, several of them traced the legislative history of the Walsh-Healey Public Contracts Act and conceded that while the original Walsh bill was definitely a wage-fixing measure, it was subsequently revised to empower the board to establish rates at prevailing levels in localities but not to peg them at rates above that level. For the Secretary of Labor to approve and make effective the board's recommendations, declared Chester A. McLain, counsel for the Bethlehem Steel Co., would be to exercise a power which Congress not only did not confer upon her but specifically refused.

Continuance Asked

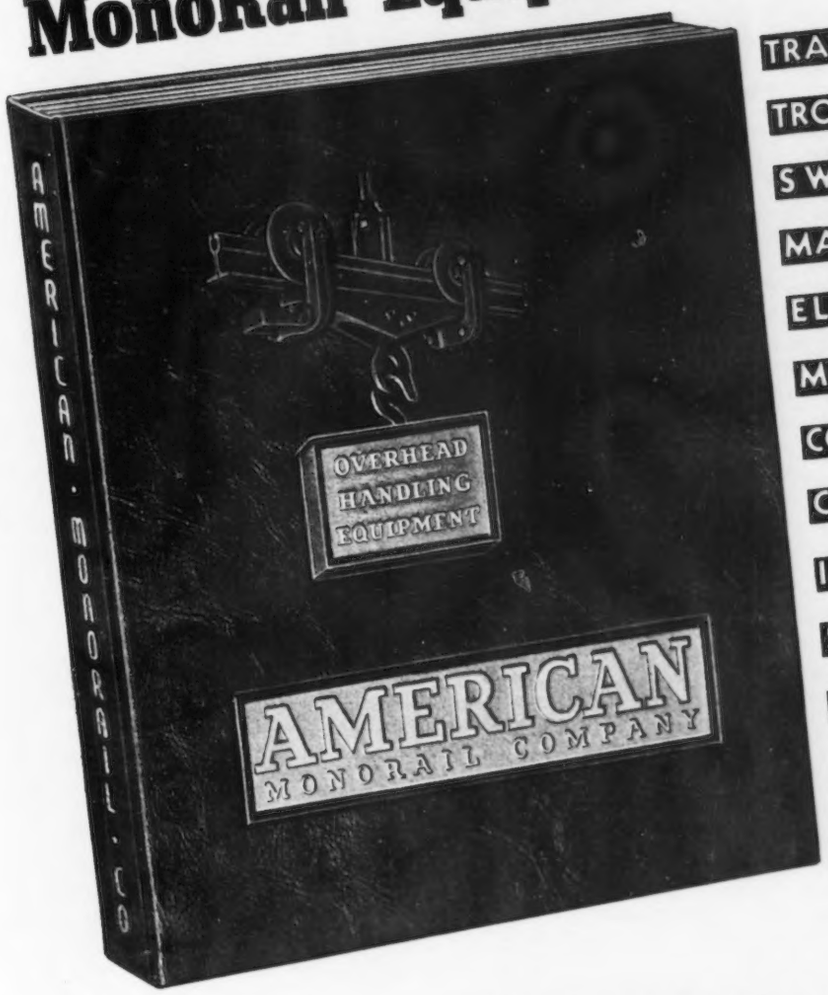
Spokesmen for the industry repeatedly requested Mr. McLaughlin to direct the board to continue its studies, particularly from the standpoint of the small company, before the order became effective. The board itself suggested that such studies ought to be undertaken but indicated that they could well be made after the new minima was ordered by the Secretary. Representatives of the industry challenged that statement, insisting that the logical, common-sense procedure would be to launch the studies immediately.

The Labor Department representative was told that the board's wage recommendations bore down particularly hard on the small firms. Roberts B. Thomas, counsel for the committee of 16 small eastern producers which had filed a joint brief protesting the boards proposal, said that the freight rate disadvantages to mills in the Eastern district had always barred them from competing with mills in the Middle Western area and that a 62.5c. minimum wage rate as recommended by the board would mean at least a 10 per cent increase in costs—a factor which he said would put many of them out of business. He charged that the board had failed to take into consideration the competitive position of small Eastern mills.

Small Plants Hit

Referring to the 45c. rate recommended in the South, Mr. Thomas pointed out that the small mills again would bear the brunt of the board's

A new catalog of MonoRail Equipment



- TRACK
- TROLLEYS
- SWITCHES
- MANUAL CRANES
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TWO COMPLETE LINES FOR MANUAL OR POWER OPERATION

This 254 page book serves as a reference for complete technical data covering every phase of overhead handling. Copy will be sent upon request on company letterhead.

This new catalog presents up-to-date information covering two complete lines of MonoRail equipment for load capacities up to 5 tons. It contains hundreds of installation pictures showing how easily American MonoRail systems solve difficult handling problems. More than forty pages are devoted exclusively to technical data ... Full showing of power operated equipment indicates the progress made in automatic operation of carriers and cranes ... Anyone interested in securing the latest information about the money saving possibilities of overhead handling can obtain a copy of this book by letterhead request.

The American MonoRail Co

13103 Athens Ave., Cleveland, Ohio

order because they would be forced to hike their minimum wages to the rate paid by the largest producers in the area. John H. Budke, counsel for the Parkersburg Iron & Steel Co., of Pittsburgh, which operates a plant 100 miles south of Wheeling, W. Va., asked that the company be placed in the Southern area where he said it does 90 per cent of its business. He described the plant as being both commercially and geographically in the South, pointing out that under the board's order the mills with whom his company competes would have a wage differential of 17.5c. below the rate to which his company would be subjected.

The recent changes in basing point differentials and price reductions were cited by two companies as endangering their competitive status in the industry. Arthur W. C. Smith, assistant manager, Phœnix Iron Co., Phœnixville, Pa., asserted that the change in pricing methods places the small non-integrated companies at a definite disadvantage, making it difficult to pay even the 56.5 minimum rate which he said was paid common labor in that area. Similarly, Harry L. Evans, general superintendent of the Central Iron & Steel Co., Harrisburg, Pa., declared that basing point changes and price reductions can only spell wage cuts and that the board's recommendations tend to intensify the hardship compelling companies to maintain wages at artificially sustained levels.

No Sweatshops in Steel

Milton H. Tucker, counsel for the Granite City (Ill.) Steel Co., and the Laclede Steel Co., of St. Louis, Mo., reminded Mr. McLaughlin that the Administration's advocacy of decentralization, elimination of monopolies, and increased competition would not be promoted by the steel wage proposal because of the hardships imposed on small companies. He argued that there was no justification for fixing minimum wages in the industry. There are no sweatshop conditions and no emergency exists, Mr. Tucker said.

A point which has been stressed by both Army and Navy Departments ever since the Public Contracts Act was put on the statute books was made by Wilbert Wear, president and treasurer of the Harrisburg (Pa.) Steel Corp., who recommended that fewer restrictions be placed on firms supplying the Government with armament materials. He said his concern manufactures some confidential items for the Army and Navy and contended that unless such companies are permitted to continue supplying Government orders, the military will have to look to untrained companies to furnish armament items. He urged greater collaboration between the Labor Department and the War and Navy Departments "to see if something can't be done for the small steel companies."

Plants May Be Moved

Other comments made on behalf of small producers were that in disturbing wage differentials which have existed for years in the industry some companies would find it necessary to move to the lower wage areas in the South; that small units in the industry already find it difficult enough to compete for Government business without "further assistance from the Public Contracts Board." James R. Remsen, of the Rustless Iron & Steel Corp., of Baltimore, took the view that to increase the minimum common labor rate from 54c. to 62.5c. is "too high a price" to pay for Government business. Many small companies, he said, will prefer not to compete.

Last to submit oral arguments to Mr. McLaughlin was Lee Pressman, counsel for the SWOC, who declared that if the board accepted the Bethlehem Steel interpretation of the law—that the Secretary of Labor is empowered by the Act to put into effect wage rates based on prevailing minimum rates within highly localized areas—"the evils at which the statute was aimed would be left alone" and there would have been no need for passing of the law.

Aimed at Wage Cuts

Mr. Pressman held that the law was deliberately aimed at stopping wage cuts and subjecting competitors for Government business to the same wage costs; that many "localities" previously determined by the board had covered in some cases the entire country on the basis that it was found to be one large competitive area; and that there had been no protests from Congress in this respect nor indications that its members intend to restrict or even clarify the board's powers in that connection.

To the view expressed by industry members that the board's recommendations would upset wage differentials existing over a long period of years, the SWOC counsel declared that was the very situation which his organization through the Public Contracts Act was seeking to correct.

Referring to other large companies which did not file briefs or voice protests at the session, Mr. Pressman insisted that some companies may feel that through the board's order the industry is being placed on a competitive basis for the first time in so far as wage rates are concerned. Minimizing any adverse effect the recommendations may have on the armament program, the SWOC spokesmen expressed sympathy with the small independent producers but emphasized that the board can't recognize differentials based on plant size when such a course would permit some companies to continue "sweating labor."

Blocks Bethlehem Rebuttal

In economic justification of the board's findings, Mr. Pressman cited these reasons: (1) the two wage areas proposed are the sections within which competitive conditions exist on both Government and private contracts; (2) the living costs are substantially the same within each area; and (3) over 70 per cent of the productive capacity in the North already pays a 62.5c. minimum wage rate fixed by collective bargaining agreements with the SWOC.

At the conclusion of Pressman's statements, Mr. McLain asked permission to present rebuttal argument. Mr. McLaughlin, who up to that point had said little throughout the session, denied the request, pointing out that he announced from the outset that rebuttal would not be permitted. Mr. McLain and other counsel for the steel companies took vigorous exception but the Assistant Labor Secretary was adamant.

Mr. Pressman, who was the last to present oral arguments and who repeatedly referred to arguments given earlier in the hearing by counsel for the steel companies, insisted that should the steel spokesmen be allowed to refute his arguments and quote from his statement he would request a similar privilege. McLaughlin closed the session after allowing Mr. McLain's exceptions to be noted in the record.

Seeks Contracts at Broadening

Even as representatives of the industry were arguing that the board had overstepped its bounds in the steel wage recommendations, the CIO announced in a press release that it was preparing to ask Congress to broaden the Walsh-Healey Public Contracts Act by barring violators of the Wagner Act from receiving Government business. The move, which is expected to make little headway in

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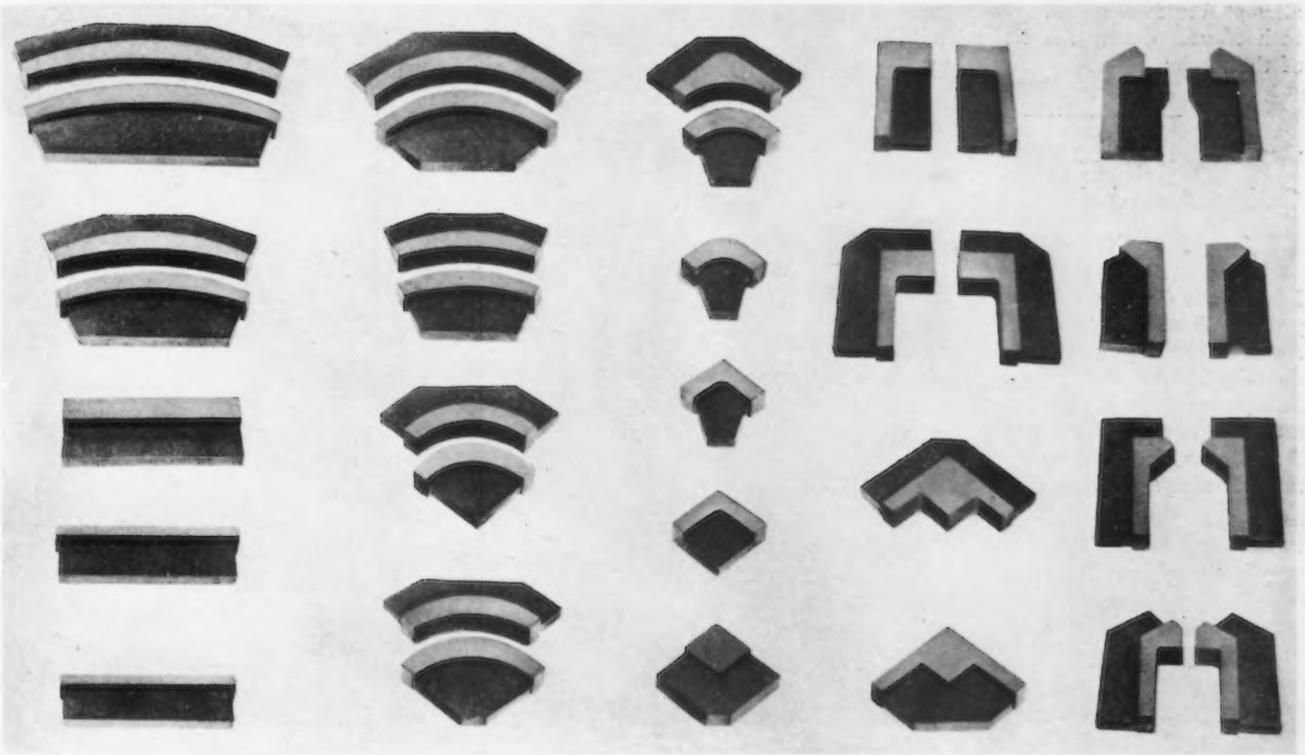

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view of opposition from both War and Navy departments, and the complexion of the new Congress, was aimed particularly, the statement said, at "Bethlehem Steel, Electric Boat and Douglas Aircraft and many others now profiting from fat Government contracts." A similar bill was defeated last session after many Congressional members protested against what they described as "high-handed tactics" on the part of CIO Chairman John L. Lewis who attempted to force the measure through both Houses during the closing days of the session.

War Department Orders Awarded

WASHINGTON.—Awards totaling $123,255.50 under the War Department's ordnance procurement program have been announced by the Assistant Secretary of War. Under the 3-in. anti-aircraft program, Joseph T. Ryerson & Sons, Inc., was awarded a $27,300 contract for steel bar stock. Awards for special machinery included the following:

Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn., profiling machines and a bench lathe to cost $50,870 and $1,081 respectively; Jones & Lamson Machine Co., Springfield, Vt., automatic lathes, $25,825.50; Hendey Machine Co., Torrington, Conn., lathes, $7,002; The La Pointe Machine Tool Co., Hudson, Mass., horizontal hydraulic broaching machine, $5,627; and the Union Twist Drill Co., Athol, Mass., circular cutter grinders, $5,550.

In addition to awards made under the ordnance procurement program, the Air Corps approved contracts with these companies: Bendix Products Division, Bendix Aviation Corp., South Bend, Ind., $49,152; Pittsburgh Screw & Bolt Corp., Pittsburgh, Pa., $57,000; Steel Products Engineering Co., Springfield, Ohio, $13,315; and the Ohio Seamless Tube Co., Shelby, Ohio. The purchases, although not broken down by company, covered wheel and brake assemblies, blade and hub assemblies, propeller blades and steel tubing. Out of purchases made by the chemical warfare service, the Mid-West Spring Mfg. Co., Chicago, was awarded a $2,082 contract for cadmium coated springs.

Harnischfeger Corp., Milwaukee, has appointed the Sligo Iron Storage Co., St. Louis, distributer for the complete line of Smootharc welding electrodes.

ICC Asks Railroads to Submit Estimates on Improvements

WASHINGTON.—Seeking authoritative estimates, the Interstate Commerce Commission has sent a questionnaire to Class I railroads asking them to state the sums they require to make up deferred maintenance and to finance improvements. An accompanying letter of transmittal, signed by Secretary W. P. Bartel, which requests that replies be made by Jan. 15, 1939, says that there is need for more exact and authoritative information on this point than is now available. He states that "it is obvious that no definite answer is possible unless a particular volume of traffic is specified" and that it is also understood that any figure given must be in the nature of an estimate, "but obviously no one can make such an estimate as well as the officers of each company."

It is understood that the commission desires to have the information ready in the event it is requested by Congress in connection with possible legislation to provide Government loans to the carriers.

Six Questions Asked

The circular asks six questions, designed entirely to learn the financial requirements needed to bring railroad property "up to a satisfactory condition for safe, adequate and modernized transportation."

Arranged in tabular form with five columns on which to note data, the first question asks: "How much would it cost to put the respondent's railway in what it considers a normal condition to handle a volume of traffic in 1939 equal to that actually experienced for the calendar year, that is, to make good deferred maintenance which has accrued to Dec. 31, 1938, under the following heads?" The heads are: Rail renewals; tie renewals; other roadway and track maintenance, including fences; bridges and elevated structures; stations and office buildings, and station facilities; shop buildings, engine houses and appurtenances; shop machinery and tools; all other maintenance of way and structures; locomotives and cars—repairs of existing equipment, additional equipment; all other repairs or purchases of equipment.

The other questions follow:

"2. Is it imperative that the entire amount shown in answer to Question 1 be available at once? If not, how much thereof should be spent annually in the next three years?

"3. By how much would the total shown in answer to Question 1 have to be increased if a volume of traffic 10 per cent greater than that of 1937 is assumed for 1939?

"4. How much should be expended annually during the three years 1939-1941 for additions, betterments, and extensions over and above the total shown for deferred maintenance in answer to Question 1 to enable respondent to handle more cheaply or expeditiously a volume of traffic equal to that actually handled in 1937?

"(Note: It is understood that adequate maintenance will permit of some modernization chargeable to operating expenses. The answers to Questions 4 and 5 should be confined to sums needed in addition to normal maintenance.)

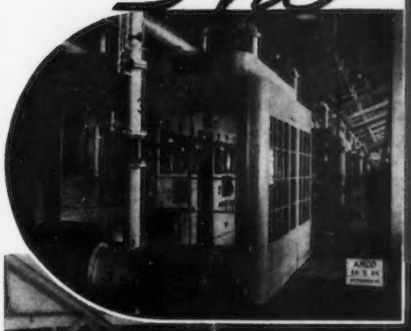
"5. How much should the total given in answer to Question 4 be increased if a traffic 10 per cent greater than that of 1937 is assumed?

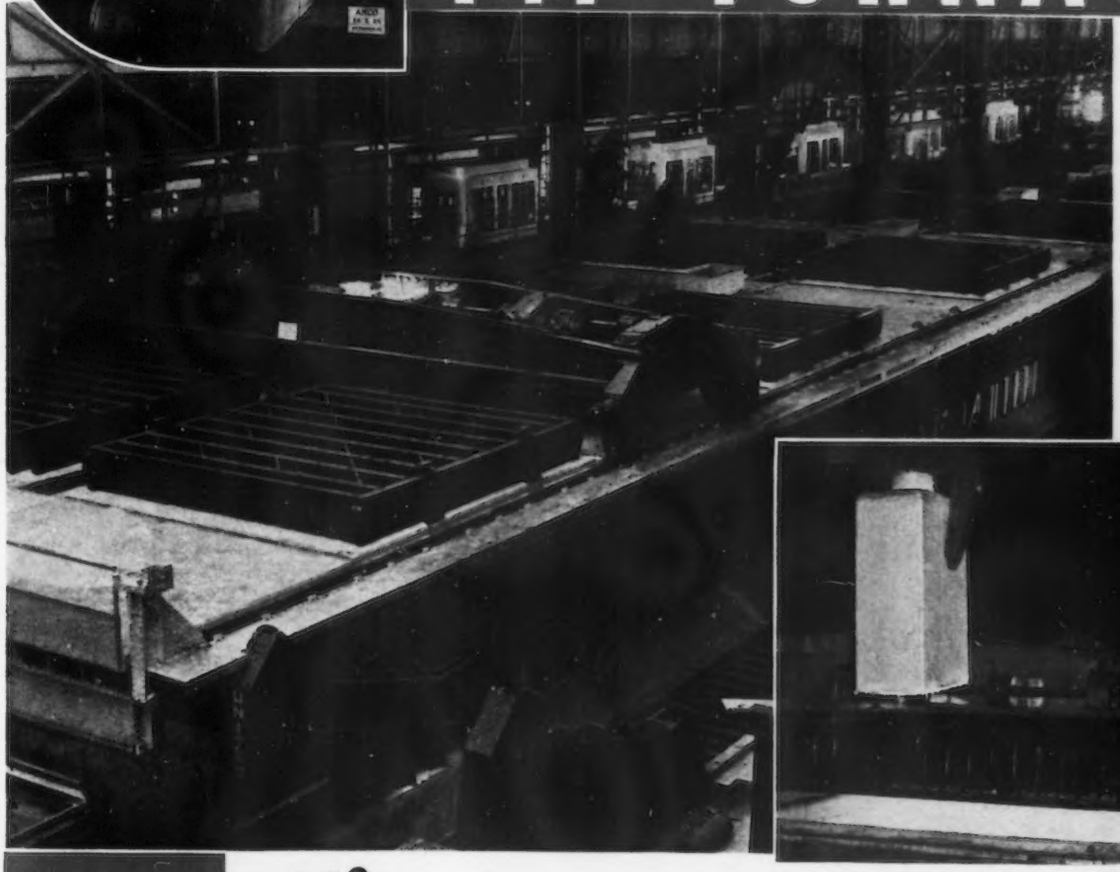
"6. Please give outstanding examples of how the increased capital expenditure referred to in answer to Question 4 and 5 would help to reduce the cost of rendering transportation service in excess of the added interest charge and amortization of the new capital."

Adjustable Voltage Applied To Skip Hoist Control

THE characteristics of the 3-field generator were adapted to blast-furnace skip-hoist adjustable-voltage (Ward Leonard) control in two equipments installed during the year, states Guy Bartlett, General Electric Co., in reviewing developments in the electrical industry during 1938. One generator and two motors were previously used for such control; in the new equipments each has two generators and two motors for the operation of the skip hoist. As it is essential that there be no interruption of hoist operation while the blast furnace is running, each generator and motor are of sufficient capacity to carry on alone if necessary. The differentially wound generators used, inherently divide the load according to the demands of the moment.

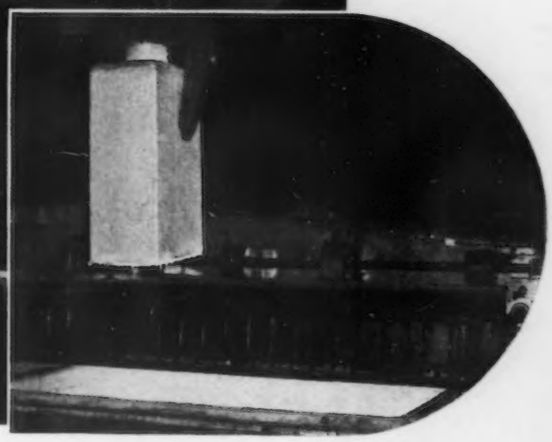
The AMCO PIT FURNACE





Upper Left — One of a battery of instrument control houses

Left — General view of 16-pit installation



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Andrews May Call Wage-Hour Hearing

WASHINGTON.—Wage - Hour Administrator Elmer F. Andrews is considering calling a public hearing to determine whether the Wage-Hour Division can by administrative order exempt all employees in the upper wage brackets from the overtime wage provision of the law.

Mr. Andrews explained at a press conference that such employees who are not already exempt from the act as professionals or executives create a problem for employers and expressed the view that it might be desirable to effect such an exemption if the change could be made without endangering the status of low-paid white collar workers.

The Wage-Hour Administrator conceded that the powers of his agency may not permit him to make such an exemption but pointed out that it could be made by him more expeditiously than if the matter was referred to Congress for revision of the law. He said he would like to first hear what labor representatives think about the change.

Some attorneys have advised their clients that employees not affected by the minimum wage provisions of the law are also exempt from receiving overtime rates of pay. The Administrator has pointed out, however, that such advice is in error.

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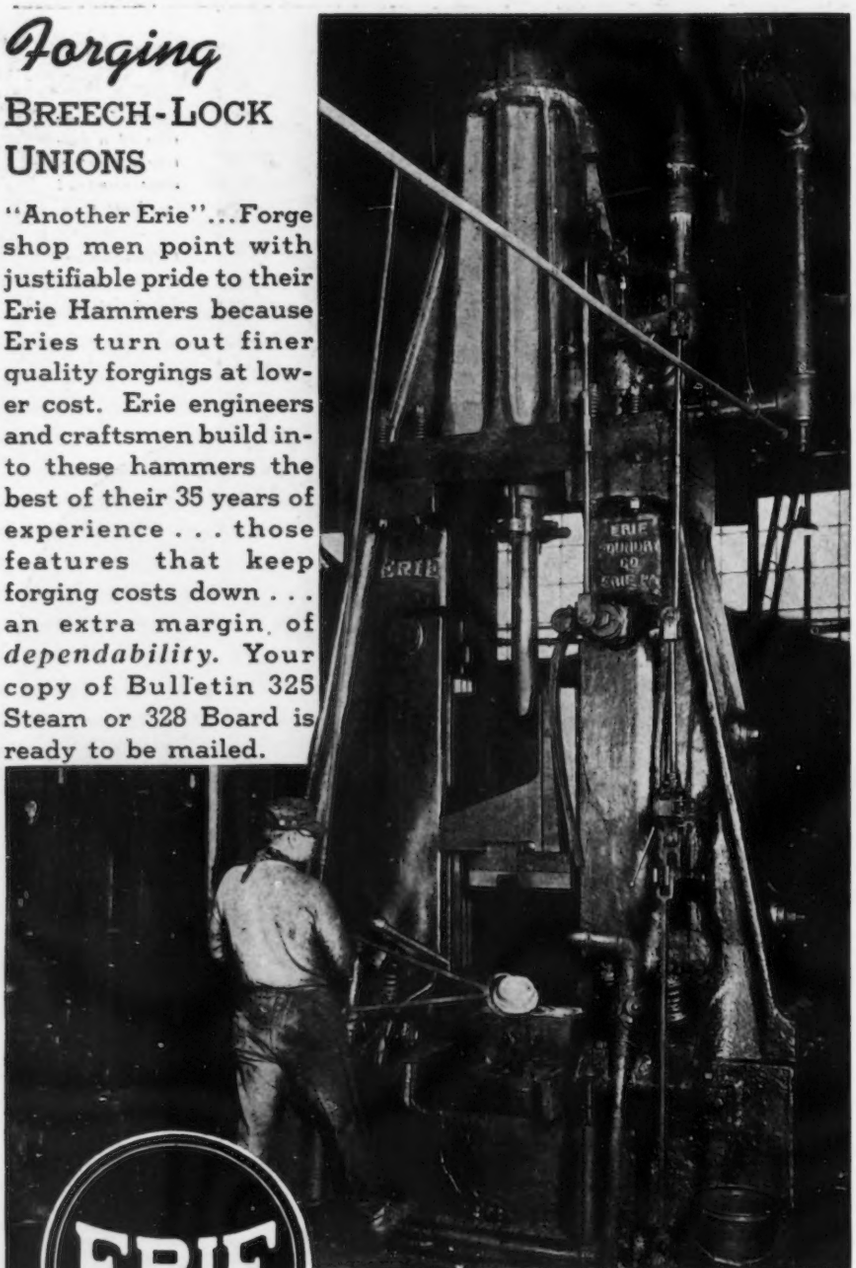

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Carnegie-Illinois Restores Salaries

PITTSBURGH.—Effective Jan. 1, the full time work week of the salaried employees of Carnegie-Illinois Steel Corp. will be on the basis of 5½ days per week, to which will apply the present base salary rates, which are on a 5½ day basis.

Those whose work requires the full 5½ days will be paid on such base salary rates. Those whose work does not require the full 5½ days will be paid on the part time basis.

The return to the 5½ day base week for salaried employees and the payment of the applicable base salary will result in restoring full time pay for those salaried employees whose work requires the full 5½ days per week.

In the case of the higher executives, full time pay will not be restored at this time.

A survey of salaried employees to be affected by this announcement is now under way to determine what per cent of the employees will be restored to the 5½ day week. However, it is believed that more than half of the salaried employees affected by the initial salary cut will have their pay restored to the full 5½ day week basis.

Iden Urges Elevated Roads for Pittsburgh

PITTSBURGH.—V. G. Iden, secretary, American Institute of Steel Construction, recently urged that Pittsburgh should take the lead in developing elevated highways, not only for the benefits it will bring to the steel industry, but for the relief it will bring to the city's traffic congestion. A business men's association, before which Mr. Iden spoke, went on record as favoring construction of the proposed wharf boulevard in such a manner that an elevated highway can be built atop it in the future if and when the need arises.

Social Security Law Widening An Issue Before Next Congress

WASHINGTON.—Hearings on recommendations of the Social Security Advisory Council for revision of the Social Security Act will begin shortly after Congress convenes and already it is clear they will develop sharply differing views, despite the widespread approval that the council's report received.

Chairman Doughton of the House Ways and Means Committee, which will conduct the hearings, is already preparing for them, realizing that they will be extensive. The opposition to the council's report, however, promises to be non-partisan. Generally the opposition, from both Democratic and Republican members of Congress, is based on a demand for ever further liberalization of the act than was proposed by the council, which recommended increased old age benefits and advancing the date to begin payment. On the other end there are indications that both Democrats and Republicans will support the council's report.

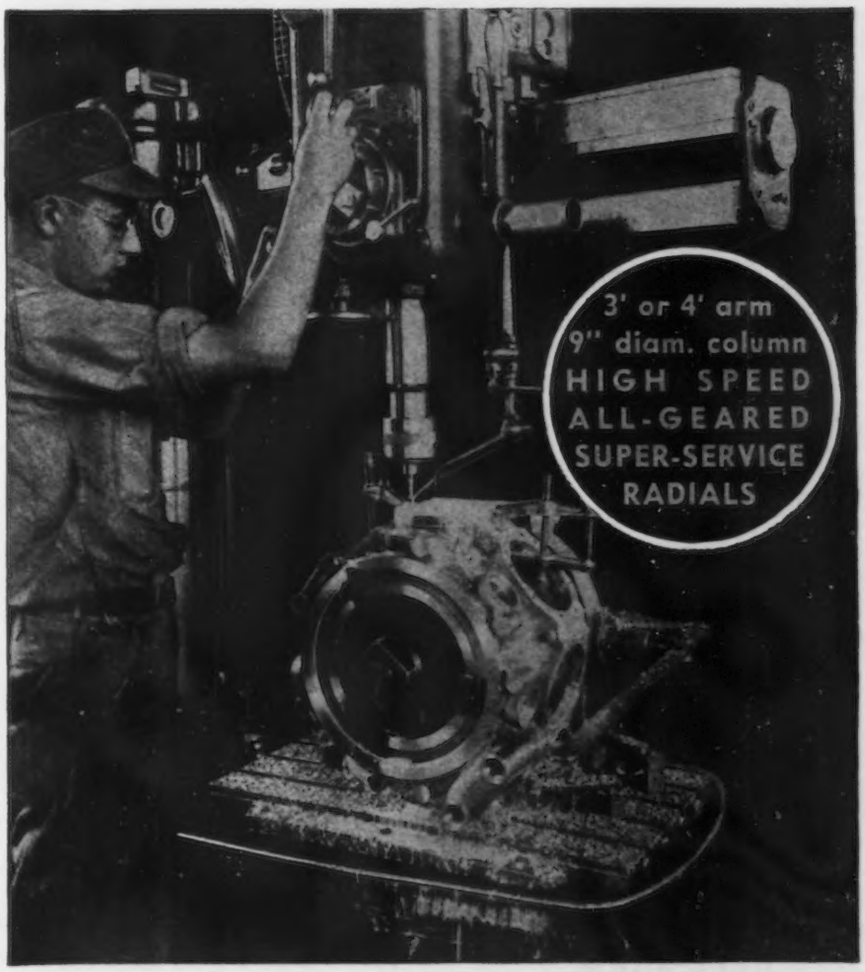
Payroll Tax Opposed

Minority Leader Treadway of the House, however, lined up with others in opposing features of the report. He announced that he would propose complete abolition of payroll taxes and said he regretted the council did not offer a substitute for such taxes. He declared that they are a burden on both employer and employee. Mr. Treadway said the contemplated reduction in the scale of taxes, as recommended by the council, will be of some help, although "it will not eliminate or reduce vexatious and costly bookkeeping."

The council recommendations also were criticized by the General Welfare Federation of America which has instituted a "security for all at 60" campaign through a 2 per cent gross income tax.

Broad expansion of the old-age insurance program, with Federal Government contribution of one-third of the additional cost, the remaining two-thirds to be shared equally by employers and employees, is recommended in the council's report which is the result of 14 months' study. The council, appointed jointly by a special Senate Finance Committee and the Social Security Board, is made up of 25 representatives of the public, employees and employers. Among the latter are E. R. Stettinius, Jr., chairman of the United States Steel Corp., and Gerard Swope, president of the General Electric Co. The report will receive early consideration by Congress which convenes Jan. 3, and it is believed that many of the recommendations will be adopted as amendments to the Social Security Act with both Administration and Republican support, though in some respects modifications of some recommendations will be asked.

The council, a non-partisan body, has received wide commendation for its proposals which largely meet criticisms that have been made of the Social Security Act by such men as Senator Vandenberg, Republican of Michigan. The Michigan Senator referred to the Council as having "done a notable job in an effective way" and said that as a result of the report Con-



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gress should hesitate no longer to make certain fundamental amendments to the act.

Recommendations of the council, if adopted, would expand the act by 1940 to add 14,800,000 persons to its present 42,000,000 beneficiaries. Immediate benefits would be extended to 400,000 seamen, 400,000 bank employees and 2,000,000 employees of non-profit religious, charitable and educational institutions. By Jan. 1, 1940, if possible, the council said farm and domestic labor, estimated to represent 6,000,000 persons, should be brought under the act. It suggested that the stamp book system be used as a means of collecting taxes from them and their employers. Additional aid for widows and dependent children also was suggested.

With two council members expressing the view that the cost would be higher, the majority estimated that the cost of financing the proposed increase in benefit payments would call for financing from all sources of an annual outlay equal to 10 to 12 per cent of payrolls in 1980, or 42 years hence when the retirement age will be reached by persons who are now in their twenties. It was also proposed that, as a means of bearing the added cost, a reduction be made after a few years to unmarried annuitants and that study be made, in order that they be made more equitable, of a possible cut in the larger benefits potentially available in the future.

Small Reserve Urged

Recognizing criticism of the present plan to create a huge accumulation of funds, the council recommended creation of a comparatively small "contingency reserve fund" instead of the full reserve of $47,000,000,000, which it is estimated will be built up by 1980. Senator Vandenberg, as a critic of this accumulated reserve, proposed that it be eliminated.

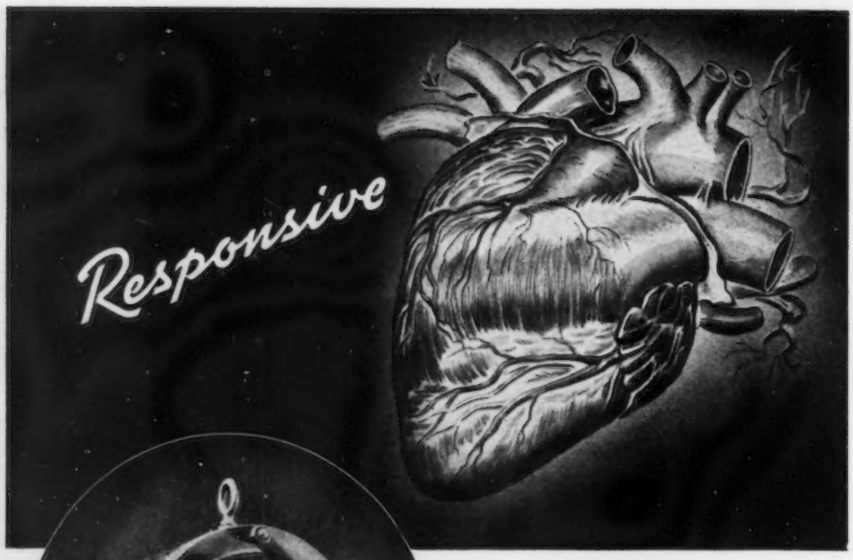
Instead of the present policy of placing revenue from old-age insurance taxes in the Treasury's general fund, the council proposed that the money be placed in special trust fund.

As pointed out by J. Douglas Brown, Princeton University economist, chairman of the council, the report emphasized two basic principles, "security for the family unit," and "the use of the insurance method" in liberalizing benefit payments.

In proposing that the date for beginning payment should be advanced to Jan. 1, 1940, from 1942, the council estimated that the average beneficiary would receive only $19 a month by 1945, and suggested that the benefits "payable in the early years should be increased." Stressing the principle of security for the family unit, the council urged payment of supplementary benefits to aged wives of beneficiaries, the wife—if over 65 years of age—to get 50 per cent of the amount paid to her husband, provided she had been married to him at least five years before he had become 65 years old. Upon death of the husband, the widow would receive an annual annuity equal to three-fourths of that which he received. But if in her own right she received benefits in excess of the allowance as a wife, the former would be paid.

In the event of the death of a worker before he becomes 65 years old, the council suggested that orphans' benefits and a widow's allowance be paid his family, the amount to be determined by the number of dependent children. The social security program would be put in a new field if the Congress adopted the council recommendation for disability insurance.

Explanation of his reservations in



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the report as a member of the council was made in a statement given out in the name of Walter D. Fuller, president of the Curtis Publishing Co., in which he said he believed strongly that the ½ per cent increase in the tax due Jan. 1, 1940, should be delayed. Mr. Fuller gave as the reason for his position the fact that, having just begun to emerge from a serious depression, employers and employees are now burdened with heavy expenditures. He stated that the proposed increase would mean a further payroll tax of $300,000,000 a year on employers and employees.

"On Oct. 1," Mr. Fuller said, "I understand we had reserved for future old-age pensions the sum of $963,000,000 and more money will continue to go into this fund at the rate of about $500,000,000 annually. . . . No one knows what benefit payments will cost in the early years, but they probably will not be as much as present annual tax payments. Why then take more from employee and employer at this critical time?"

Government Steel Awards for Week

WASHINGTON.—Iron and steel awards under the Walsh-Healey Act for the week ended Dec. 17, aggregated $997,264.48 while machinery contracts amounted to $739,428.38 and Government purchases of electrical apparatus and supplies amounted to $2,088,140.21. Details follow:

IRON, STEEL & THEIR PRODUCTS:

Bridgeport Thermostat Co., Bridgeport, Conn., practice bombs	$114,800.00
Crucible Steel Co. of America, steel forgings	37,130.00
National Tube Co., Pittsburgh, steel forgings	160,000.00
Bethlehem Steel Co., Bethlehem, Pa., steel forgings	200,400.00
Midvale Co., Washington, steel forgings	29,646.70
Steel Improvement & Forge Co., Cleveland, steel forgings	16,818.50
Wm. R. Bootz, Evansville, Ind., practice bombs	24,152.00
Crucible Steel Co. of America, New York, forgings	104,037.50
Russakov Die Casting Co., Chicago, bombs	14,062.50
Bethlehem Steel Co., Bethlehem, Pa., forgings	27,150.00
A. Finkl & Sons Co., Chicago, forgings	23,172.50
Truscon Steel Co., Newark, N. J., doors	22,074.00
Carnegie-Illinois Steel Co., Washington, tees and beams	33,300.00
Central Iron & Steel Co., Harrisburg, Pa., steel plates	105,000.00
Carnegie-Illinois Steel Corp., Washington, angles, beams, tees	26,700.00
Stupp Brothers Bridge & Iron Co., St. Louis, bridge	19,871.00
Crucible Steel Co. of America, New York, steel, tool	21,282.01
Washington Corrugated Culvert Co., Spokane, Wash., gates	17,667.77

NONFERROUS METALS & ALLOYS:

Caswell Strauss & Co., Inc., New York, tin	$92,877.12
Bart Laboratories, Belleville, N. J., mirrors, metallic	101,400.00
Revere Copper & Brass, Inc., Baltimore, brass pipe	25,012.50

OTHER MACHINERY:

Worthington Pump & Machinery Corp., Washington, air compressors	$12,000.00
Schramm, Inc., West Chester, Pa., air compressors	23,392.00
Enterprise Engine Co., San Francisco, propelling plants	463,582.00
The Lodge & Shipley Machine Tool Co., Cincinnati, lathes	13,188.00
Rockford Machine Tool Co., Rockford, Ill., planers	31,540.00
Pratt & Whitney, Hartford, Conn., borer	10,324.00
Reed-Prentice Corp., Worcester, Mass., lathes	25,272.00
Brown & Sharpe Mfg. Co., Providence, R. I., milling machines	18,374.00
Henry Prentiss & Co., Inc., New York, boring, drilling and milling mach.	22,874.10
Rockford Machine Tool Co., Rockford, Ill., slotting machines	16,490.00
Bullard Co., Bridgeport, Conn., lathes	17,535.20
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn., jig boring mach.	20,934.00
R. G. LeTourneau, Inc., Peoria, Ill., road scrapers	10,222.74
McClure Machinery Co., El Paso, Texas, tractor-scraper-bulldozer assembly	16,602.34
Caterpillar Tractor Co., Peoria, Ill., tractors	20,342.00
Kennedy Van Saun Mfg. & Eng. Corp., New York, jaw crusher	16,756.00

ELECTRICAL APPARATUS & SUPPLIES:

Electric Storage Battery Co., Philadelphia, battery assemb.	$91,578.60

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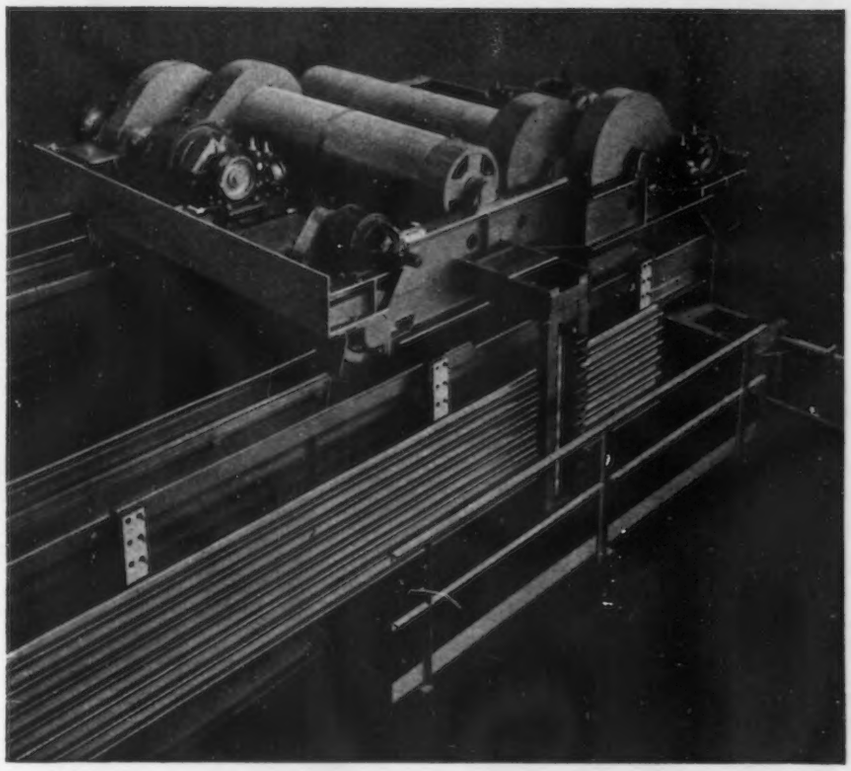

● Shop view of part of a 60 ton, 4 motor, 86 foot span Crane having a 20 ton auxiliary. All welded, full roller bearing—(custom built to meet rigid requirements).

ALSO BUILDERS OF CLEVELAND TRAMRAIL

THE CLEVELAND CRANE & ENGINEERING CO

1115 Depot St.

WICKLIFFE, OHIO

NEW YORK • DETROIT PITTSBURGH • CHICAGO

MATERIALS HANDLING EQUIPMENT

. . . PERSONALS . . .

JAMES M. WOODWARD, JR., has been appointed superintendent of bar mills at Gary works of Carnegie-Illinois Steel Corp. Mr. Woodward began his service with Carnegie-Illinois Dec. 1, 1937, as superintendent of steel provision at Gary works merchant mills and was employed in this capacity until his present appointment. His experience in the steel industry prior to his association with Gary works included the following positions: inspector of rails, merchant bars, and other steel products, chief inspector, engineer in charge of metallurgical laboratory, strip mill recorder and general foreman of four-high hot strip mill.

Mr. Woodward has been associated with several steel mills, the last being Great Lakes Steel Corp., where he began as a strip mill recorder later becoming general foreman of that company's 4-high hot strip mill.

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DONALD GRAHAM CLARK has been appointed director of purchases, Gulf Oil Corp., Pittsburgh. Previous to this appointment, Mr. Clark was comptroller of the Brown & Sharpe Mfg. Co., Providence, R. I. He is a graduate of Brown University and Harvard Law School.

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GEORGE J. PARKER has been appointed assistant to district industrial engineer, Chicago district, Carnegie-Illinois Steel Corp. Mr. Parker began his service with the corporation in April, 1936, at Gary works. He was employed in the industrial engineering division and remained there until his present appointment. He has been in this type of work since 1927 but with companies not affiliated with the United States Steel Corp.

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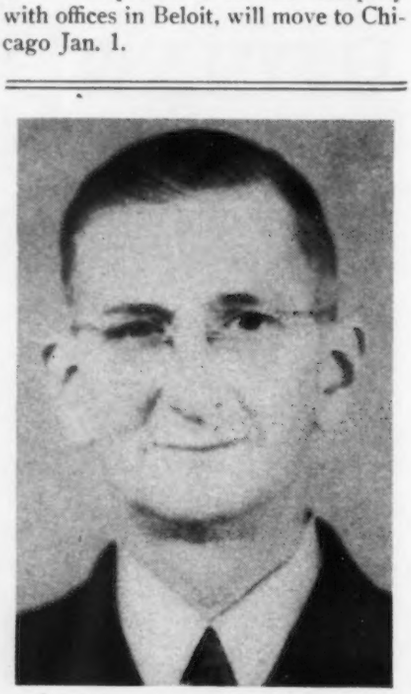
ALLAN E. ASHCRAFT has been appointed vice-president in charge of operations in seven plants of Fairbanks, Morse & Co. He will direct operations at the plants at Beloit, Wis.; Three Rivers, Mich.; St. Johnsbury, Vt.; San Francisco; Moline, Ill.; and Stuttgart, Ark. Mr. Ashcraft, who has been vice-president of the company with offices in Beloit, will move to Chicago Jan. 1.



J. M. WOODWARD

BERTRAM G. PARKER, SR., president and general manager, Youngstown Foundry & Machine Co., has been elected president of the Youngstown Chamber of Commerce. WILLIAM B. GILLIS, vice-president, Youngstown Sheet & Tube Co., has been elected first vice-president of the Chamber.

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CLYDE P. CRAINE, president and director of Craine Schrage Steel Co., Detroit, and vice-president and director of Detroit Steel Corp., has resigned because of ill health.

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HARRY M. FRANCIS has been appointed assistant vice-president in charge of sales of the American Steel & Wire Co., Cleveland. Mr. Francis has been associated with the company for 23 years, having entered its employ as a messenger in the New York office in 1915. Later he became a salesman. After serving as assistant manager of sales at the Philadelphia office, he returned to New York in 1925, and in 1927 was transferred to the Boston office as manager of the manufacturers trade department. In 1934 Mr. Francis became New England district manager of sales, which position he retained until being transferred to the main offices in Cleveland as assistant general manager of sales.

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S. A. CRABTREE and W. J. JACK have been appointed assistant district sales managers of Republic Steel Corp. in the Chicago territory. During Mr. Crabtree's career he has served Berger Mfg. Co., United Alloy Steel Co., and

D. G. CLARK

G. J. PARKER

H. M. FRANCIS

Central Alloy Steel Co., prior to the formation of Republic. In 1933 he was transferred to the Chicago district. Mr. Jack's career includes service with American Sheet & Tin Plate Co., West Leechburg Steel Co., and Trumbull Steel Co. With the Republic-Trumbull merger in 1928 he was made manager of strip sales and in 1931 following the Republic Steel Corp. merger was appointed assistant manager of sheet and strip division, which position he held until transferred to Chicago.

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W. L. THOMA, of the San Francisco district sales office of Republic Steel Corp., has been appointed district sales manager of that territory. He joined the Bourne-Fuller Co.'s Chicago sales staff in 1927 and later became Pacific Coast manager, in which position he continued until the inclusion of the Bourne-Fuller Co. among the companies forming the Republic Steel Corp. Since that time he has been doing general sales work for Republic in the San Francisco district.

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E. G. HILL has been appointed assistant to general superintendent in charge of technological coordination; F. E. MOONEY, assistant to general superintendent, production; and J. N. QUINLAN, assistant division superintendent, West mills, of Gary works, Carnegie-Illinois Steel Corp.

Starting his business experience in 1913, Mr. Hill was employed by various mining and construction companies as miner, assistant mill superintendent, and mill superintendent until 1918 when he became an instructor of mining engineering at the Carnegie Institute of Technology. Two years later, he went to the University of Pittsburgh as associate professor of metallurgy, and remained there until 1931 when he became engaged in research work at the Mellon Institute. Since 1934 he has been director of research of Lukens Steel Co.

Mr. Mooney went to Gary works open hearth department in 1923 and during his employment there served as second helper, labor foreman, and assistant superintendent. In 1936 he was transferred to the corporation's South works as assistant superintendent of No. 3 open hearth and bessemer. Returning to Gary in 1937 he was made superintendent of No. 2 open hearth and remained in this capacity until his present appointment.

Mr. Quinlan's entire business career in the steel industry was spent at Gary works where he started as a clerk in 1907. During his 31 years of service

W. L. THOMA

with the corporation he was employed as construction foreman, construction division foreman, loading checker, plant steel distributer, chief order clerk, superintendent of production, and assistant to general superintendent, process and control, the position he held until the present time.

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CHARLES E. BRINLEY, who has been acting vice-president of the Baldwin Locomotive Works, Philadelphia, has been elected president succeeding GEORGE H. HOUSTON, who resigned last summer. WILLIAM H. HARMAN, vice-president of the Baldwin-Southwark Corp., has also been elected vice-president in charge of sales of the Baldwin Locomotive Works. ROBERT S. BINKERD has resigned as vice-president and director of sales.

Mr. Brinley has been associated with the American Pulley Co., Philadelphia, in various capacities since 1901 and has been its president since 1919. He is a graduate of Yale University and has had a broad business experience. He is a member of the American Society of Mechanical Engineers and a trustee of the Drexel Institute of Technology.

Mr. Harman was for 21 years a member of the staff of R. D. Wood & Co. and for some time prior to his leaving that company in 1915 held the position of salesmanager of the hydraulic machinery division. From 1915 to 1929 he was president of the Southwark Foundry & Machine Co., and when the Southwark Foundry company became in 1929 part of the Baldwin group under the corporate name of the Baldwin-Southwark Corp., Mr. Harman was made vice-president and general manager.

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ERNEST NIEDERER, who resigned recently as works manager of the Clearing Machine Corp., Chicago, has been appointed works manager of the Verson Allsteel Press Co., Chicago. Mr. Niederer completed his education at the Wismar University, Germany, where he obtained his M.E. degree in 1925.

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JOSEPH F. HEIL, associated with the Heil Co., Milwaukee, since 1923, and vice-president since 1931, has been elected executive vice-president. He is the only son of Julius P. Heil, founder, president and treasurer, who will be inaugurated Governor of Wisconsin on Jan. 2. The son started in the factory at the bottom.

GEORGE W. KUHLMAN, manager of the Heil Co.'s Eastern factory at Hillside, N. J., has been elected a vice-president of the firm. He started in the main works at Milwaukee in 1919 and several years afterward was appointed manager of branches at Philadelphia and New York, then being advanced to Eastern manager. When the firm established the plant at Hillside, he was advanced to general manager there.

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R. C. STUART, for several years president of the Barlow & Seelig Mfg. Co., Ripon, Wis., manufacturer of washing machines and other laundry appliances, has been elected chairman of the board. He is succeeded by R. I. PETRIE, a former executive of the Kelvinator Corp., Detroit.

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CHARLES FASSINGER, SR., has resigned as vice-president of Oliver Iron & Steel Corp., Pittsburgh. He started with the corporation in 1895, working up through the manufacturing departments to the general managership of the plant, and early this year was elected vice-president in charge of development and research. Mr. Fassinger has not as yet announced his plans for the future.

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CHARLES A. FERGUSON, former assistant general superintendent, Farrell works, Carnegie-Illinois, has been appointed assistant general superintendent Gary sheet and tin mills. Mr. Ferguson has been with the corporation since 1913, serving as assistant master mechanic, master mechanic, assistant manager, manager, and general superintendent of various plants of the corporation since that time.

JOHN E. ANGLE has been appointed

division superintendent, sheet mills. Mr. Angle has served as cold reduction foreman, metallurgist and in other capacities at the sheet and tin mills.

W. G. HOFFMAN, former chief engineer, sheet and tin mills, is now division superintendent tin mills. Mr. Hoffman was first employed by the corporation in 1900 as an office boy in the general office of the American Sheet & Tin Plate Co., Pittsburgh. He was appointed chief engineer in 1936 after service as blueprint boy, tracer, draftsman, estimator, chief estimator, assistant to chief engineer, and superintendent of construction.

FRED K. SCHEFE, former assistant chief engineer, as chief engineer succeeding Mr. Hoffman. Mr. Schefe was employed in 1930 at the tin mill experimental shop and worked as draftsman, foreman in the cold reduction department and assistant to resident engineer of the sheet mill until 1936 when he was appointed assistant chief engineer.

BEN HUFF, former acting superintendent at the corporation's American works at Elwood, Ind., has been named assistant to chief engineer, sheet and tin mills. Mr. Huff has been connected with the steel industry since 1901 and served with several United States Steel Corp. subsidiaries as machinist, shop foreman, assistant master mechanic, and master mechanic.

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V. H. DEARLE has been named by Carboloy Co., Inc., Detroit, manufacturers of cemented carbide tools, dies, and wheel dressers, as assistant Detroit district manager. Mr. Dearle has been with the company since its formation in 1928. He is a charter member of the American Society of Tool Engineers and has been connected with the tool industry in Detroit for over 30 years in executive capacities in automobile plants, refrigeration plants and tool companies.

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JOSEPH BECKER, vice-president and a director of Koppers Co., Pittsburgh, has been made president of Koppers-Rheolaveur Co. He is also general manager of Koppers Co.'s engineering and construction division and has been with the company since its beginning.

W. S. MCALEER, manager of Koppers-Rheolaveur Co., has been made a vice-president and director. He joined the former Koppers Construction Co. as an engineer in 1926 and was made manager of Koppers-Rheolaveur last July.

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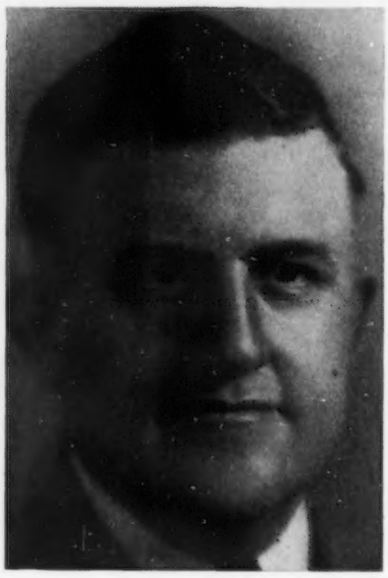
LEO ISAACS has been appointed manager of the Pittsburgh district, the Kemper-Thomas Co., Cincinnati. He has been connected with this company for the past several months.



I. C. KINNEY

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IRVIN C. KINNEY, who has been advertising manager of the Tennessee Coal, Iron & Railroad Co., Birmingham, has been appointed assistant manager of sales of the company's sheet and wire products division, effective Jan. 1. Mr. Kinney enters his new position with wide experience in sales activities. His business career was started with the Stockham Pipe & Fittings Co., with which he served as Southern sales representative. He later joined the Moore-Handley Hardware Co., where he remained for over 15 years, resigning in 1937 to join the Tennessee company as assistant advertising manager. He was promoted to advertising manager in November, 1937.

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HARRY F. KNAPP has been appointed manager of sales, special accounts, Carnegie-Illinois Steel Corp., Pittsburgh, with headquarters at Washington. ANDREW J. SNOW has been made manager of sales of the Washington district sales office, succeeding Mr. Knapp.

Mr. Knapp has been associated with the Carnegie-Illinois Steel Corp. since 1903, when he joined the organization at its Philadelphia sales office. He went to Washington in 1915 and 11 years later was appointed assistant manager of sales of that district office. He has been manager of sales there since 1931.

Mr. Snow has spent his entire business career with the company since leaving the Carnegie Institute of Technology in 1912. He served in various capacities at the mills in the general offices and since 1932 has been assistant manager of the Washington district sales office.

REINFORCING STEEL

. . . Awards of 5250 tons; 12,560 tons in new projects.

ATLANTIC STATES AWARDS

170 Tons, Buffalo, Horan O'Donnel Chemistry and Physics building, Canisius College, to Buffalo Steel Co., Buffalo.

150 Tons, Kenmore, N. Y., Senior High School, to Bethlehem Steel Co., Bethlehem, Pa.; through C. F. Haglin & Sons, Buffalo contractor.

130 Tons, Rehoboth, Del. school, to Bethlehem Steel Co., Bethlehem, Pa.

110 Tons, Camden County, N. J., school, to Bethlehem Steel Co., Bethlehem, Pa.

110 Tons, Perry County, Pa., highway, to Bethlehem Steel Co., Bethlehem, Pa.

100 Tons Pittsburgh, Thaddeus Stevens School, to Truscon Steel Co., Youngstown; through Siesel Construction Co., contractor.

SOUTHWEST

710 Tons, Parker, Ariz., Indian Irrigation Service, to Columbia Steel Co., San Francisco.

425 Tons, Fort Sill, Okla., barracks, to Sheffield Steel Corp., Kansas City.

290 Tons, Blaisdell, Ariz., Gila project, to Bethlehem Steel Co., San Francisco.

252 Tons, Blaisdell, Ariz., Gila project, to Columbia Steel Co., San Francisco.

CENTRAL AND WESTERN STATES

4000 Tons, Chicago, subway section S5, to Inland Steel Co., Chicago; through Herlihy Construction Co. (previously reported).

850 Tons, Odair, Wash., Bureau of Reclamation, Invitation A38215, to Bethlehem Steel Co., San Francisco.

500 Tons, Grosse Point, Mich., Junior High School, to Truscon Steel Co., Youngstown; F. H. Martin Construction Co., contractor.

250 Tons, Iowa City, Iowa, Courier Hall, University of Iowa, to Laclede Steel Co.; through C. C. Larson, Council Bluffs, Iowa, general contractor.

250 Tons, Indianapolis, Junior Education Building, to Truscon Steel Co., Youngstown; W. C. R. Muth Construction Co., contractor.

238 Tons, Bellingham, Wash., city hall, to Seattle Steel Co., Seattle; through S. S. Mullen, Seattle, contractor.

164 Tons, Berkeley, Cal., police building, to Gilmore Fabricators, Inc., San Francisco; through Dinwiddie Construction Co., San Francisco.

163 Tons, San Francisco, presidio buildings, to W. S. Wetenhall Co., San Francisco; through Robert E. McKee, Los Angeles, general contractor.

136 Tons, Oxford, Ohio, dormitory, Miami University, to Pollak Steel Co., Cincinnati.

116 Tons, Dover, Ohio, school building, to Pollak Steel Co., Cincinnati.

105 Tons, Oakdale, Cal., grammar school to Kyle & Co., Fresno, Cal.

PENDING REINFORCING BAR PROJECTS
ATLANTIC STATES

1800 Tons, Kittery, Me., Piscataqua bridge; previously reported 900 tons.

475 Tons, Holabird, Md., barracks.

370 Tons, Delaware County, N. Y., mostly mesh, highway project R.C. 4010; Mohawk Paving Co. Inc., Buffalo, low on general contract.

300 Tons, Pittsburgh, four mile run drainage basin.

295 Tons, Suffolk County, N. Y., mostly mesh, highway project R.C. 2553; Gould & Kress, Inc., New York, low on general contract.

250 Tons, Pittsburgh, Columbus Avenue basin, sewer.

193 Tons, Columbia County, N. Y., mostly mesh, highway project R.C. 2558; bids taken until Jan. 17, 1939, by Department of Public Works, Albany, N. Y.

CENTRAL AND WESTERN STATES

8040 Tons, Seattle, pontoon section of Lake Washington Bridge; Puget Sound Bridge & Dredging Co., Seattle, J. H. Pomeroy & Co., San Francisco, and Parker-Schram Co., Portland, joint low bidders on general contract (previously reported).

2500 Tons, Fitzsimmons, Colo., Army hospital.

1000 Tons, Los Angeles, Palos Verdes reservoir; bids in on readvertisement.

1000 Tons, Ann Arbor, Mich., men's dormitory.

950 Tons, Greenville, Miss., part of foundation for bridge over Mississippi River; Massman Construction Co., Kansas City, general contractor.

950 Tons, Natchez, Miss., foundation for bridge across Mississippi River; Dravo Corp., Pittsburgh, general contractor.

700 Tons, Mare Island, Cal., Navy warehouse; bids Jan. 25.

600 Tons, Rockford, Ill., West Senior High School.

280 Tons, Columbus, Ohio, Ohio State University dormitories.

250 Tons, Minneapolis union garage.

250 Tons Dillon, Mont., school.

230 Tons, Miami, Mo., bridge over Missouri River; Massman Construction Co., Kansas City, Mo., general contractor.

200 Tons, Alpena, Mich., hospital.

180 Tons, Plainfield Ind., Indiana Boy's School.

175 Tons, Elkhart, Ind., bridge.

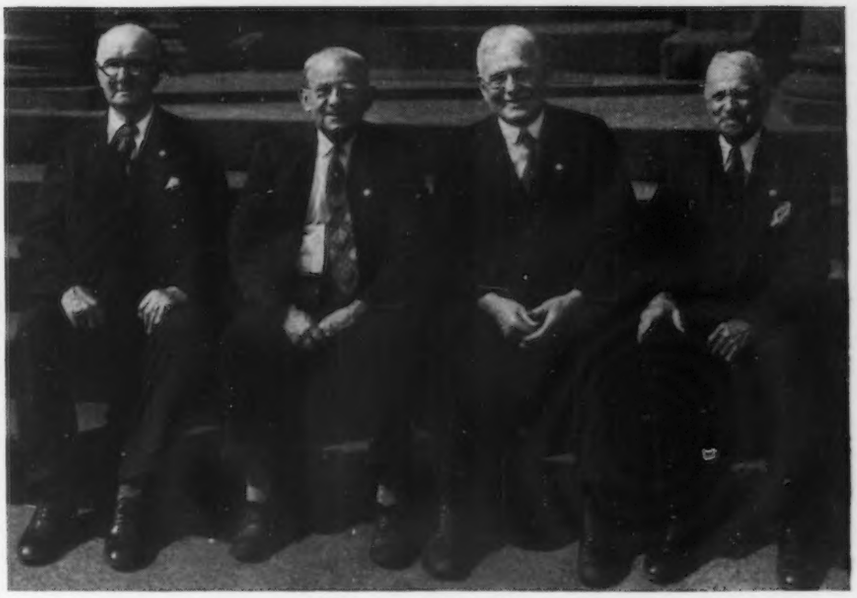
148 Tons, Kingman, Ariz., highway work; bids Dec. 31.

141 Tons, Sacramento, Cal., junior college buildings; Azevedo Construction Co., Sacramento; low bidder on general contract.

120 Tons, Ripon, Mich., high school.

Eaton Mfg. Co. Buys Massillon Plant Site

CLEVELAND.—Eaton Mfg. Co., automotive parts manufacturer, with plants in Ohio and Michigan, has purchased a plant and additional land in Massillon, Ohio, adjoining its Reliance Spring Washer division. Further expansion at Massillon will occur when business warrants it. The company also is preparing to construct an extension to its stamping plant here in Cleveland, probably a one-story addition containing about 20,000 sq. ft. of floor space.



Reading from left to right: Wilbur M. Gladding, 57 years; John F. Galvin, Sr., 53 years; Henry C. Stevenson, 53 years, and Flavel W. Woodworth, 71 years. With years of service the four men total 234 years.

Pratt & Whitney Men Given Service Pins

PRATT & WHITNEY, Division Niles-Bement-Pond Co., Hartford, Conn., has been making machine tools, small tools and gages since 1860. During those 79 years there have been some remarkable service records among employees. There have been cases of several generations of the same family on the rolls.

The company's employment rolls show a surprisingly large percentage of people employed steadily for ten or twenty or more years. The records are not confined to the ranks. Many of the top executives have worked up from shop jobs and can claim long periods of service.

Such a record could not go on indefinitely without recognition. That is why the company caused service pins to be specially designed and made which would mark their wearers as veterans. Five pins were produced, dividing those veterans into groups of 10, 20, 30, 40 and 50 or more years of service. These pins are heavy solid gold and each bears the company name and monogram and the period of years it stands for. The background is a brilliant blue enamel except for the monogram which is in characteristic Pratt & Whitney red. The 10-year pin is plain. The 20-year pin carries one diamond, the 30-year pin two diamonds, the 40-year pin three diamonds while the 50-year pin boasts one large diamond, greater than all the rest.

There were 794 pins given out during the week of Dec. 12, 1938. This was the initial distribution, putting the plan into effect. Among the men 389 received 10-year pins, 272 were given 20-year pins, 55 have 30-year pins, 27 the 40-year pins, and 4 men proudly wear the big diamond designating 50 or more years of service. These four men between them aggregate over 235 years of service.

There were 47 women receiving pins become the personal and perma- the 20-year group. Considering the comparatively small number of women employed by the company, that record alone is noteworthy.

It is the company's intention that all pins become the personal and permanent property of the recipient. Thus a man with 15 years' service behind him wears a 10-year pin now, but in five years more he receives another with one diamond as he enters the 20-year class.

Four Companies Get Meehanite Licenses

Meehanite Metal Corp., Pittsburgh, has recently granted Meehanite production licenses to: Perry Engineering Co., Kalgoorlie Foundry Co., Goninan Co.—all of Australia—and Fleming Foundry Co, Springfield, Mass.

. . . THE NEWS IN BRIEF . . .

New book on grinding and polishing practice by Johnson Heywood.—**Page 39.**

Resistance welding of dissimilar metals discussed at meeting of Detroit section of American Welding Society.—**Page 39.**

Four-day work week asked by UAW cuts auto production 10 per cent. . . . Plans for new car and engines being pushed. . . . Ford makes plan for housing project near Rotunda.—**Page 40.**

Bridgeport Brass Co. plans first sales convention in its 73-yr. history.—**Page 43.**

FTC issues "desist" order to wirewood silo makers.—**Page 43.**

Court test of steel wage ruling likely as former union leader hears evidence for Labor Department . . . Further liberalization of Social Security Act to be issue. . . . Abolition of payroll tax urged.—**Page 44.**

Labor Department expected to disregard protests of small steel companies and recommend wage minimums on Government contracts.—**Page 44.**

Adjustable voltage applied to skip hoist control.—**Page 48.**

Interstate Commerce Commission sends questionnaire asking for estimates on amounts needed for railroad maintenance, improvements.—**Page 48.**

War Department awards $123,255 in contracts under its ordnance procurement program.—**Page 48.**

Administrator Andrews may call a public hearing to determine whether employees in upper wage brackets can be exempted from law's overtime pay provisions.—**Page 50.**

Iden urges elevated roads for Pittsburgh.—Page 50.

Carnegie-Illinois Steel Corp. restores 5½-day work week for its salaried employees.—**Page 50.**

Four men whose service with Pratt & Whitney, Division Niles-Bement-Pond Co., totals 235 years, receive gold pins.—**Page 53D.**

Nineteen thirty-eight steel production fell back to level of 1934, but 1939 opened with improved prospects, says Walter S. Tower, executive secretary of American Iron and Steel Institute.—**Page 56.**

First of three Monopoly investigation questionnaires are sent to 54 steel companies by Department of Justice, Assistant Attorney General Arnold.—**Page 58.**

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MEETINGS

Jan. 9 to 13—Society of Automotive Engineers, Detroit.

Jan. 10 to 12—Institute of Scrap Iron and Steel, St. Louis.

Feb. 9 to 11—Conference of iron, steel and allied industries, Del Monte, Cal.

Feb. 14 to 17—Purchasing Agents Association, Indianapolis.

April 26 to 29—Electrochemical Society, Columbus, Ohio.

Complete public library branch, said to be first of its kind, is installed in Carnegie-Illinois Steel Corp.'s Gary plant.—**Page 62.**

National Munitions Control Board announces rules governing issuance of licenses for exportation of tin plate scrap.—**Page 63.**

Ryan Aeronautucal Co. works on two of the largest orders for exhaust manifold equipment ever let.—**Page 63.**

ICC orders inquiry on Bethlehem road.—**Page 63.**

World's largest heavy tube plant starts operation.—**Page 73.**

Republic Steel Corp. officials are cleared of charges filed by five stockholders in connection with stock purchases.—**Page 74.**

Iron and steel scrap composite again unchanged at $14.92, with dullness prevailing in most markets. New export orders from Europe and the Orient.—**Page 74.**

Harry L. Hopkins, social worker and biggest spender in the nation's history, succeeds Daniel C. Roper as Secretary of Commerce.—**Page 82.**

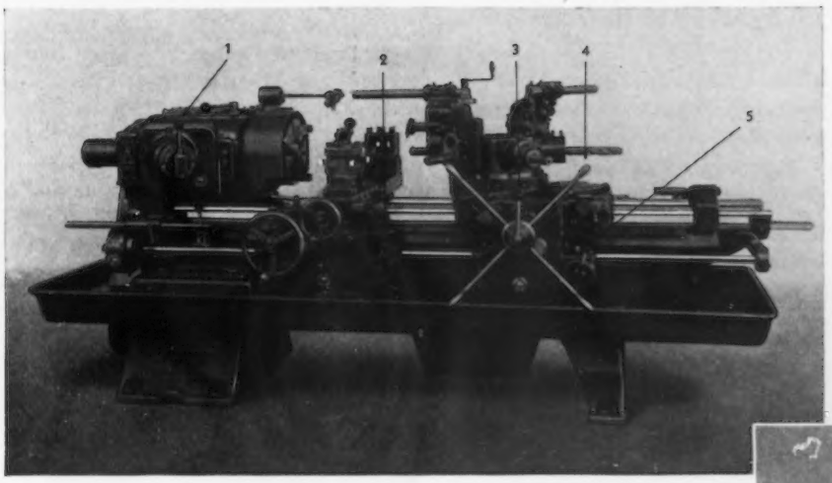
Japan builds an experiment station to test new machine tools for munitions and other industries.—**Page 82.**

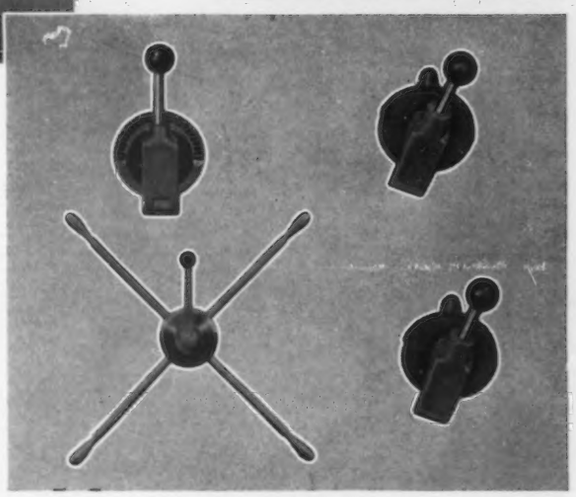
American Welding Society sponsors series of 17 lectures on welding in modern industry through the Armour Institute of Technology, Chicago.

Liberalization of Social Security Act likely to be issue shortly after Congress convenes.

The National Industrial Advertisers Association decides to continue free employment service to companies, individuals in advertising, marketing fields.

Here's what the Jones & Lamson Universal Turret Lathe will do for you





1 Improve the Quality of Your Product.

2 Increase Your Hourly Production.

3 Give You Maximum Earnings Per Dollar Invested in Turret Lathes.

Study THE PRODUCTIVE ADVANTAGES

OF THE 49 DISTINCT OPERATING MOVEMENTS INCORPORATED IN 5 CONTROL LEVERS

THE HEADSTOCK.

12 Speeds.
1 Neutral.

THE CARRIAGE.

9 Longitudinal Feeds.
9 Cross Feeds.

THE SADDLE.

1 Right hand manual movement of saddle.
1 Left hand manual movement of saddle.
1 Right hand power traverse movement of saddle.
1 Left hand power traverse movement of saddle.
1 Slow speed power traverse movement of saddle.
1 Unclamping of turret clamp ring.
1 Withdrawing of turret locking pin.
1 Power indexing of turret.
1 Reclamping of turret clamp ring.
9 Longitudinal Feeds.

Total . 49

IN purchasing a Turret Lathe, the selection should be based on the earning power per dollar invested, and on the knowledge that the machine has ample speed, power and rigidity to meet present-day requirements with a reserve for future developments of cutting tools.

JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT

1938 Steel Production Fell Back to Level of 1934, But 1939 Opens with Improved Prospects

By WALTER S. TOWER

o o o

THE production of steel in this country in 1938 fell back almost to the level of 1934. As a result, total output for the year was more than 40 per cent below that of 1937.

The course of operations in the industry during 1938 was almost the reverse of that for 1937.

The year began with operations at a deeply depressed level, and during the first half of 1938 the operating rate averaged only 31 per cent of capacity. In the first half of 1937 it was 85 per cent. In the last quarter of 1938 the rate averaged close to 57 per cent compared with 41 per cent in the last three months of the preceding year.

The operating rate for 1938 approximated 40 per cent against 72 per cent for 1937. Outside the depression years of the 1930's, only one other year in more than a generation has averaged so low in steel output.

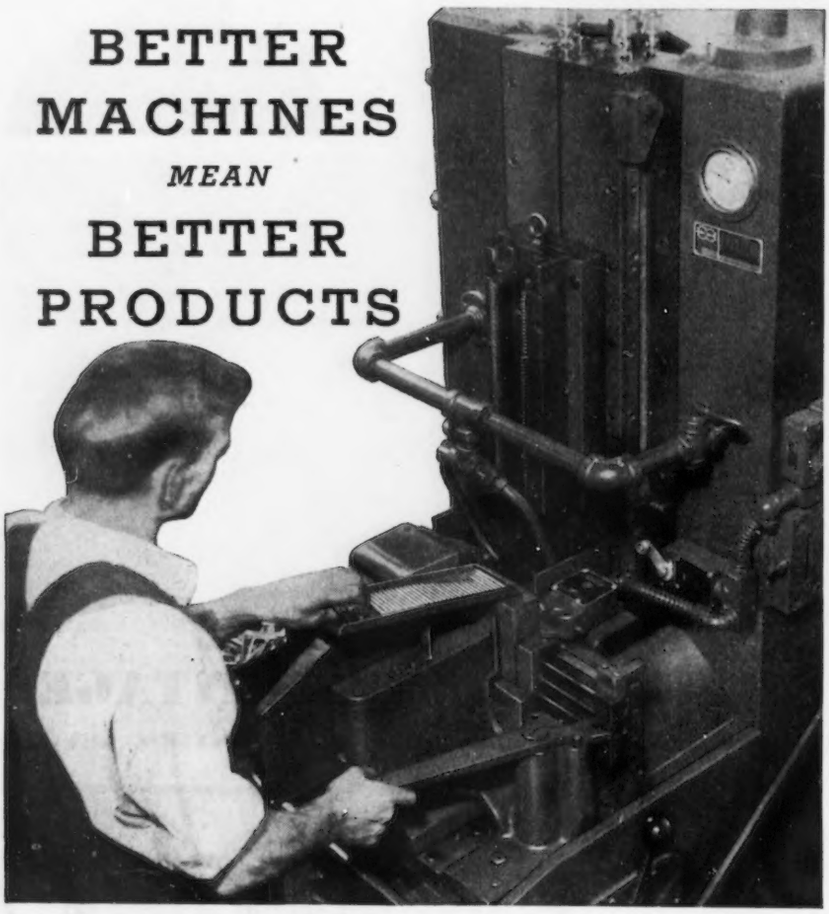
WALTER S. TOWER, executive secretary, American Iron and Steel Institute.

The highest monthly rate reached in 1937 was 90 per cent in April, while the peak for 1938 was 62 per cent in November. The upturn during the final quarter of 1938 was the most pronounced of any fourth quarter since 1921.

The actual output of steel ingots for 1938 will be close to 28,500,000 gross tons compared with 50,569,000 gross tons in 1937 and with 47,768,000 gross tons in 1936.

Because of the reduced volume of business, combined with other factors, operations during the first nine months of the year resulted in aggregate losses for the industry estimated at approximately $23,000,000. Better operating rates for the last quarter indicate some probable improvement in the earnings

BETTER MACHINES *MEAN* BETTER PRODUCTS



● The trend in American Industry is sharply toward giving better value—by cutting costs, improving parts or the whole, by smoothing and speeding the way to production.

Only constant alertness—sharpest scrutiny of production methods can give a producer a place in this marching parade.

Production men, of *all* men, should know the Oilgear Story . . . how a steady stream of improvements both major and minor keep Oilgear Presses, Broaches, etc. at the head in these important production-tool fields.

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BROACHING MACHINES AND PRESSES

statements which will be made for that period.

The industry is entering the final year of the 1930's decade with a record of having earned over the nine years an average of approximately only 1.5 per cent annually on its capital investment. In the 10 years from 1920 through 1929, the return averaged 5.5 per cent. The year 1939 seems likely to mark the end of the only 10-year period in the modern history of the industry in which no new high record of yearly production was recorded.

Notwithstanding adverse conditions affecting operations during 1938, wage rates of employees in the industry were unchanged, remaining at the highest level in the history of the industry.

The lower production rate necessitated some reduction in employment and in total payrolls, but the declines in these items were not as severe as the shrinkage in output. Compared with a drop of 56 per cent in production during the first nine months of 1938, employment declined only 26 per cent.

The average number of wage earners for the first nine months of the year was 385,000, compared with 521,000 in the corresponding period of 1937, when a record was established in employment. Before the close of the year, however, the tide of employment had turned and additions to payrolls were reported during the last quarter.

1938 Payrolls $600,000,000

Total payrolls of the industry in 1938 were over $600,000,000 as compared with $976,083,000 in 1937, which was the highest ever reached.

The upturn in the steel business which came in the latter half of the year had its origin chiefly in the larger demand for light steels such as sheets and strip from the automobile industry. That improvement broadened somewhat as the year progressed. A better demand appeared from oil and gas, structural and some other lines, although the gains were not as large in these departments as in the steels used by automobile companies.

Purchases by the railroad industry remained far below normal. Some encouraging improvement appeared in the construction industry although the demand from this source was still far below the levels which prevailed before 1930.

Despite the maintenance of wage rates at 1937 levels, and the failure of other costs to decline to any important extent, prices were reduced sharply on virtually all steel products during 1938. A development of far-reaching importance was the elimination of price differentials which had long existed at certain basing points, together with the establishment of numerous new basing points for various products.

The full ultimate effect of such changes in the basing point method of quoting prices is not yet apparent, especially with respect to competition, distribution of business among competitors and the location of plants of steel producers and steel consumers.

New Year Has Better Prospects

During 1938, the steel industry continued to spend large sums for modernization and improvement of its productive equipment. The industry allocated approximately $165,000,000 for this purpose during the year, largely for finishing facilities. This made the total of such expenditures for the four years from 1935 through 1938 ap-

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proximately $840,000,000. As a result it is probably safe to say that at the end of 1938 the steel industry's plants were in better condition to take care of a large volume of business at lower prices for higher quality products than ever before in the history of the industry.

The steel industry enters 1939 with better prospects than those of a year ago.

54 Steel Companies Receive Monopoly Committee Questions

WASHINGTON.—Making the initial move in an inquiry of the steel industry by the Temporary National Economic Committee, the first of three Department of Justice-Federal Trade Commission questionnaires was mailed out last week to 54 companies representing 90 per cent of the country's ingot capacity and covering 10 "significant" carbon steel products.

The questionnaire to follow will go to the same producers and require information on similar products. The second questionnaire is expected to be in the hands of steel executives by the latter part of the present week. Both questionnaires are being sent out by the Department of Justice with accompanying letters signed by Thurman Arnold, assistant attorney general.

The questionnaire already mailed, identified as "Form B," asks for information on distribution and pricing of the 10 steel products for February, 1939. A future month was chosen, it was explained, in order that the date may be supplied as invoices are made out, thereby avoiding the necessity of checking past records.

Export Figures Sought

Request is made for date on the basing point on which the delivered price was computed, the consuming districts, total invoiced delivered value, freight charges added to base prices, actual freight paid or allowed on shipments from individual mills to destination and the total extras in invoice delivered value. A record of exports also is required. The questionnaire lists 64 domestic consuming districts, made up of 48 states and subdivisions of states, together with a number of large local areas, such as metropolitan New York, Philadelphia, Eastern Pennsylvania, Pittsburgh, Cleveland, Youngstown, etc.

In his letter, Mr. Arnold told steel companies that "at a later date, when seasonal pressure upon clerical personnel of reporting companies has lifted, similar information will be required for a single month in each of the years 1937 and 1938" The second questionnaire prepared on "Form A" asks for data on distribution only but will be more extensive than the first since it will ask for records for 1936, 1937 and 1938.

Chosen to Show Spread

The products covered and to be covered are sheet and tin plate bars, hot and cold rolled sheets, hot and cold rolled strip, plates, heavy plates, tin plate, wire rods and plain wire. These

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ON THE TRUCK AND THE AUTOMOBILE
ON INDUSTRIAL EQUIPMENT
ON FARM IMPLEMENTS
LANSING STAMPING COMPANY
SO. PENN. AVENUE, LANSING, MICHIGAN

lines were chosen, it was stated, because they are considered to be "significant" products, not only because of the large tonnage they represent but also by reason of their relationship in processing, such as that existing between sheet and tin plate bars and their finished lines, hot and cold rolled sheets. Prices on such lines manifestly will show the spread between the semi-finished and finished products.

Basing Points to Be Studied

That the basing point system and its operation are to be studied also is clear for the questionnaire just sent out—with similar information required in another yet to be prepared. It asks steel manufacturers to state the basing points on which delivered prices were computed, the freight paid, and the freight allowed. The latter information clearly is desired to show the freight a producer has absorbed where is was necessary, in order to meet competition, to base prices on a point nearer the consuming source than is his own plant.

The questionnaire requires a record of shipments and prices applying to each mill and each product, a task that in the case of medium and large size companies will call for a great deal of time and clerical work. In the case of products which are quoted Gulf ports, or Pacific Coast ports with price differentials among ports, the Department of Justice said in its instruction that Gulf ports or Pacific Coast ports will be considered a single basing point in each case.

Sheet for Each Works

Indicative of the work that will be entailed in preparing information was this paragraph contained in the Department's instructions:

"Separate sheets should be used for each works, each product, and each basing point on which delivered price was computed. For example, if the company operates two separate works, produces and ships from each of those works three of the selected products, and prices each of those products on three basing points, its final report will be made on 18 separate sheets of "Form B." With one works, nine sheets would be required; with one works and one product, three sheets."

Steel companies were told that if it is impracticable to provide the information requested separately for each works, they should give the name and location of each of the works for which data are aggregated and indicate the distance between works and the ways in which integrated operations are effected Warning was given that under no circumstances must the data combine the operations of works in different basing point areas. With each questionnaire went an affidavit to be executed by the steel official responsible for the information supplied.

No date has been set to begin the steel inquiry before the TNEC. The hearings will be extensive. It is believed they will start before the questionnaires are returned and relate to a wide range of material not covered in the questionnaire.

CAST IRON PIPE

Newport, R. I., has placed 1750 ft. of 6-in., 6000 ft. of 8-in. and 4750 ft. of 12-in. pipe with Warren Foundry & Pipe Corp., New York, through a contractor.

Portland, Me., has contracted with Warren Foundry & Pipe Corp., New York, through a contractor for 8530 ft. of 12-in. Federal class 150 pipe, and 4260 ft. of 16-in.

Yarmouth, Me., has purchased 2000 ft. of 10-in. pipe from Warren Foundry & Pipe Corp., New York.

Water Department, 735 Randolph Street, Detroit, asks bids until Jan. 6 for 72 and 36-in. pipe lines in section of Tierman Ave-

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★ Reduce handling costs

★ Cut maintenance

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CRANES *Northern* HOISTS

nue for main water supply. L. G. Lauhardt is general manager.

Shelby, N. C., plans pipe lines for extensions in water system and other waterworks installation. Fund of $56,000 has been arranged for this and improvements in sewer system.

Springfield, Ohio, has plans for pipe line extensions in water system, with other waterworks installation, including new filtration plant, dam on Beaver Creek, low-lift pumping machinery and accessories, 4,000,000-gal. concrete reservoir and miscellaneous equipment. Cost about $1,065,0[illegible] Alvord, Burdick & Howson, 20 North Wacker Drive, Chicago, are consulting engineers.

Farmersburg, Iowa, plans pipe lines for water system and other waterworks installation. Cost over $50,000. Financing has been arranged through Federal aid. Burd, Bartels, Eitel & Cullen, Lincoln Building, Dubuque, Iowa, are consulting engineers.

Summerville, Ga., plans pipe line extensions and replacements in water system, following recent purchase of pipe lines and plant, heretofore owned and operated by former Summerville Cotton Mills, to be municipal property in future. Other waterworks equipment also will be installed.

Northhampton, Mass., plans pipe line extensions in water system; also other waterworks installation, including pumping machinery and auxiliary equipment. Cost about $120,000. Morris Knowles, Inc., Westinghouse Building, Pittsburgh, is consulting engineer.

North Middletown, Ky., plans about 2400 ft. of 6-in., and 5760 lin. ft. of 4-in. pipe for water system; also 50,000-gal. elevated steel tank and tower, and other waterworks installation. Hide B. Forbes, Taylor Building, Richmond, Ky., is consulting engineer. Fund of about $50,000 is being arranged for work.

California Water Service Co., Bakersfield, Cal., E. B. Walthall, vice-president, plans about 25,000 ft. of 21 to 6-in., for extensions and improvements in local water system, including trunk lines and distributing mains. Also will drill four new wells and install pumping plant, booster station and other operating facilities, with one 500,000-gal. and one 100,000-gal. storage tanks. Cost about $250,000. Work will be carried out early in 1939.

St. Stephen, S. C., plans pipe lines for water system and other waterworks installation. Cost about $27,000. Work will begin soon.

Newton, Kan., closes bids Jan. 5 for pipe and fittings for water system (Section 8); also for 3,000,000-gal. steel storage tank (Section 2), pumping machinery (Section 3), and other waterworks installation. Cost about $91,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

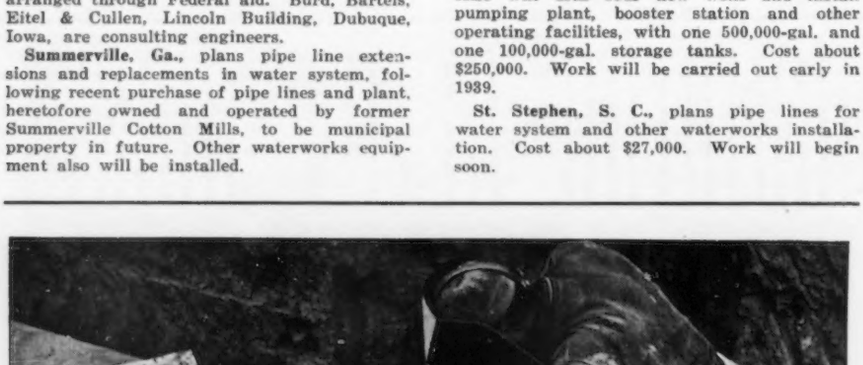
Dixon, Mo., has awarded contract for waterworks improvements to H. A. Grabbe Construction Co., Alton, Ill., at $30,657, subject to approval of PWA. Russell & Axon, St. Louis, are engineers.

Kennett, Mo., has awarded contract for a water distribution system extensions to Brayton Construction Co., Dyersburg, Tenn., at $21,558 and deep well and pump house to Carlos Well Co., Memphis, Tenn., at $15,970, subject to PWA approval. Russell & Axon, St. Louis, are engineers.

Gilman, Wis., is in the market for 12,214 lin. ft. of 6 and 8-in. water pipe and 20 hydrants for new $50,000 waterworks system. Percy L. Kingman is city clerk.

Melrose, Wis., has accepted low bid of Jacobs Bros., Bird Island, Minn., for furnishing pipe and laying distribution system at $26,610.

Augusta, Wis., will lay waterworks and sewer main extensions costing $50,000 as WPA project. Work will start next spring. Mrs. Nellie McArthur is city clerk.



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. . . PIPE LINES . . .

Quartermaster, Marine Corps, Washington, asks bids until Jan. 4 for 4910 ft. of welded steel pipe, ⅛ to 2-in. diameter; also for 3950 ft. of galvanized welded steel pipe, same sizes (Schedule 370).

Bay St. Louis, Miss., closes bids Jan. 7 for steel pipe line system for natural gas distribution. F. P. Joseph, Glenmora, La., is consulting engineer.

Humble Oil & Refining Co., Houston, Tex., plans welded steel pipe line from Flag Lake oil field, Navarro County, Tex., to point near Mildred, Tex., about 25 miles, for crude oil transmission. Connection will be made with main pipe line system at latter point. Right of way for line is being secured and work is scheduled to begin early in 1939. Pumping stations will be installed for booster service. A steel pipe line gathering system will be provided in oil field district.

Consolidated Utilities Co., Hales Building, Oklahoma City, Okla., plans steel pipe lines for natural gas distributing system at Sterling, Okla., including main welded steel pipe line for connection with supply source. Work will be carried out early in 1939.

United States Engineer Office, Vicksburg, Miss., asks bids until Jan. 3 for 2000 ft. of 3-in. wrought steel pipe (Circular 147).

Kansas Pipe Line & Gas Co., Norton, Kan., has plans maturing for 16-in. welded steel pipe line from Hugoton, Kan., gas field and from Panhandle gas field district in Oklahoma to points in Minnesota, about 1300 miles in all, for natural gas transmission, and has filed petition with Federal Power Commission to disclaim jurisdiction over the proposed new pipe line system. Company holds that its pipe lines will not enter a natural gas market now being served, within the meaning of the Natural Gas Act. Lateral pipe lines are planned to different districts in Kansas, Nebraska, North and South Dakota and Minnesota to serve about 129 municipalties in these states with natural gas for domestic and industrial purposes. Work on project is scheduled to begin in 1939, with cost estimated at $21,270,000. Of this amount, main trunk line will cost $12,675,680; branch and lateral lines, $3,480,000, and six main compressor stations for booster service, $2,300,000.

United States Engineer Office, Post Office Building, Savannah, Ga., closes bids Jan. 4 for one cast steel Y-pipe complete; also for three cast steel hopper gates (Circular 115).

Constructing Quartermaster, Fort Douglas, Utah, asks bids until Jan. 5 for one lot of black steel pipe; also for wrought iron pipe (Circular 6140-15).

High Strength of Furnace-Brazed Joints Explained

(CONTINUED FROM PAGE 34)

in evidence, in order to serve the purpose of this illustration. In the major portion of the sample traces of the joint had entirely disappeared.

From the equilibrium diagram of the iron-copper system, Fig. 77, it will be noted that molten copper, represented at the right-hand side of the diagram, can take into solution about 4 per cent of iron at the copper-brazing temperature, 1150 deg. C. (2100 deg. F.). Most of the iron is separated out on slow cooling. It will also be noted, on the left-hand side of the diagram, that iron can take into solution about 8 per cent copper at 1150 deg. C., most of which is separated out on slow cooling. Thus copper within the joints absorbs iron, and the abutting steel surfaces within the joints absorb copper—effects which are apparent in the photomicrograph, Fig. 78, and which result in strong bonds as illustrated by the foregoing charts.

Surfaces Bound Together

The photomicrograph Fig. 78 shows a copper-brazed joint between two tightly-assembled pieces of low-carbon steel of slightly different analyses. The copper-rich alloy can be seen as a fine irregular line threading its way in and out through the center of the dark band across the middle of the field. The dark band indicates where the copper has alloyed with the steel. The knitting effect across the joint also can be seen, as evidenced by the grains of iron projecting from both surfaces which interlock and form a number of bridges to solidly bind the surfaces together.

Alloy Strength Higher

We know that alloys of copper and iron have greater strength than pure copper. Hanson and Ford have demonstrated this in a series of tests. The results of such tests to determine the tensile properties of rolled and annealed copper-rich alloys are shown in the chart Fig. 79. In this chart it is seen that the tensile strength of the alloy increases 52 per cent, or from 32,500 to 49,500 lb. per sq. in., as the iron content goes up from 0.06 to 2.09 per cent. This maximum strength of 49,500 lb. per sq. in. takes on real significance when compared with the tensile strength of annealed copper and annealed low-carbon steel—30,000 to 35,000, and 50,000 to 55,000 lb. per sq. in. respectively.

(TO BE CONTINUED)

Osborn Mfg. Co., Cleveland, has purchased the assets of the Johns Conveyor Corp., Newark, N. J., acquiring all rights for the manufacture and sale of this equipment in the United States.

Mn Content of Cast Iron

(CONTINUED FROM PAGE 29)

In the sixth experiment small lumps of manganese ore and coke breeze were placed in baskets in alternate layers, the quantity of ore used being adjusted in anticipation of about 30 per cent Mn losses inside the cupola. With

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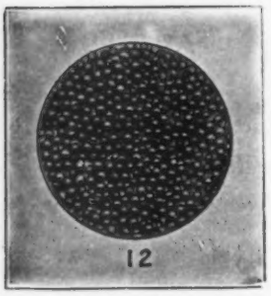
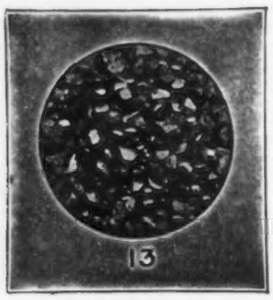


SHOT



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One contract calls for 300 tons of our steel grit; another contract calls for 250 tons of our Special Heat-Treated Shot. Many carload lots of both shot and grit.

There must be a reason for this, and the reason is plain: namely, unusual quality; prompt deliveries; uniform quality the year round; satisfactory prices.

Send samples of the sizes you are now using. We will match any size, and name prices that will interest you.

We manufacture a shot and grit that you will eventually use.

HARRISON ABRASIVE

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MANCHESTER, NEW HAMPSHIRE

We Never Compromise With Quality

this arrangement the Mn pick-up amounted to 0.54 per cent.

0.99 Per Cent Mn Secured

In conclusion the author of the articles stated that by adding 70 lb. of ore (analyzing 22.5 per cent Fe and 34.3 per cent Mn) to pig iron with 0.45 per cent Mn, it was possible to secure molten metal with 0.99 per cent Mn.

Working on the basis of ore costing Rs. 8 (about $2.88) per ton and ferro-manganese at Rs. 225 (about $81) per ton, a saving of approximately Rs. 3 (about $1.08) per ton can be realized. It is emphasized that the availability of ore is an important factor in the economies that may be realized by its use in place of ferro-manganese.

In the accompanying table the results of the various experiments are tabulated.

Set-up Registers for Metal Working Machines

(CONTINUED FROM PAGE 24)

same. The register at the left end may read 1610, for example, and the register at the right end may read 1623, due to slight differences that occur between the ends of a long press brake and a long die. Whatever they may be, the two readings are stamped on the proper ends of the die.

Shearing machines are provided with set-up registers in a similar way to press brakes, one being geared to the screw drive at each end of the machine. In this application, the set-up register makes setting for variation in camber easy, fast, and accurate. Once the best camber for a given blade and type of sheet has been determined, the figures are read off on the two set-up registers. When this same job comes up again, the operator just runs the screws till the settings of record appear on each register and is ready to shear. Fig. 2 shows a set-up register installed near the adjusting screw on the right end of a press brake or shearing machine.

In a similar way, die presses can be fitted with set-up registers. The register is connected through its drive shaft to the shaft which controls the up-and-down adjustment of the slide of the press. When a new die is put into use, the press is adjusted in the usual way till the desired setting has been secured. At this particular position of the press the set-up register will show some scale reading such as 1102, as in the illustration. This reading is recorded in a book or marked on the die. Thereafter, whenever this particular die is put into the press for repeat jobs, the press can be quickly run down till the setting 1102 appears on the register. The press is then ready to start without repeating the time-consuming process of trying and fitting.

Cold-rolled forming machines use set-up registers for adjusting the successive rolls to the correct setting to make certain that each set does its proper amount of forming. Lathes and milling machines are among other types of metal working machines that have been recently provided with set-up registers for greater accuracy in production.

The great amount of time saved in securing accurate repeat set-ups of dies, rolls, and tools on metal working machines by the use of set-up registers is rapidly increasing their use.

Library Branch Set Up In C-I's Plant at Gary

CHICAGO.—A complete branch of the Gary, Ind., public library has been established in the Gary works of Carnegie-Illinois Steel Corp. This is said to be the first time that a public library branch has been installed in an American industrial plant.

The plant library is in the main office building and includes about 7000 volumes of encyclopedias, tetchnical works on engineering, metallurgy, etc., and books of history, biography and fiction.

Library cards issued by the Gary Public Library can be used at the Gary works branch and employees receiving cards from the plant branch will find them honored at other branches throughout the city, making available 180,000 volumes. Employees unable to go to the library may telephone their requests for books and they will be delivered in a proposed "library cart" which would go through the plant at regular intervals.

Ralph R. Shaw, city librarian of Gary gives much credit to Earl E. Moore, general superintendent of Gary works, for the materialization of this branch library.

Tin Plate Scrap Export Rules Announced

WASHINGTON.—The National Munitions Control Board, State Department, has announced rules governing the issuance of licenses for the exportation of tin plate scrap during the calendar year 1939, making three changes from former regulations. By one new provision the allotment for export during the year by any one producer is limited to 2000 tons. Under another additional provision licenses will not be issued during the first six months for the exportation of tin plate scrap in quantities in excess of 50 per cent of any allotment of 50 gross tons or more. A third change fixes the basis for total exports next year at 20 per cent of the 1937 production. The 1938 basis was 25 per cent of the 1936 production. The allowable amount for shipment abroad in 1939, however, will be about the same as it was during the present year since the 1937 output was greater than that of 1936.

The new rules require that exporters submit to the Secretary of State not later than Jan. 10 a request for an allotment, specifying in gross tons the amount they desire to export between Jan. 11 and Dec. 31.

ICC Orders Inquiry On Bethlehem Road

WASHINGTON.—The Interstate Commerce Commission has ordered an investigation concerning the status of the South Buffalo Railway Co. which connects the Bethlehem Steel Co. plant at Lackawanna, N. Y., with trunk line carriers, and is controlled by the Bethlehem Steel Corp. The commission will seek to learn the South Buffalo's accounting, operating and other practices, together with compensation for its services.

Ryan Aeronautical Bookings Increase

SAN DIEGO, Cal.—With a current back-log of unfilled orders at an all-time high, Ryan Aeronautical Co., San Diego, is well ahead of scheduled deliveries, according to T. Claude Ryan, president. Current contracts include the two largest orders ever let for exhaust manifold equipment, plus a group of military training planes for export to Central America. The total value is approximately $375,000. Work is being speeded in anticipation of additional contracts which are pending.

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SPRINGS
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. . . OBITUARY . . .

WILLIAM B. SWIFT, retired purchasing agent of the International Harvester Co., died last week in Chicago, aged 69 years. Mr. Swift had been an employee of the Harvester company for 42 years.

❖ ❖ ❖

ROBERT RIDGWAY, a prominent construction engineer and director of subway projects in New York and Chicago, died last week in Ft. Wayne, Ind., aged 76 years. Mr. Ridgway, who was a member of the commission which planned Chicago's new subway system, was en route to New York after witnessing the subway ground breaking ceremonies in Chicago, when he was stricken with a heart attack at Ft. Wayne and there removed from the train.

Mr. Ridgway was in charge of much of the engineering of building aqueducts, dams, and reservoirs in New York State and from 1900 to 1905 directed construction of tunnels in the East River in New York and Brooklyn. The famous Catskill aqueduct was constructed under his supervision. In New York he directed subway projects aggregating $300,000,000 and in 1914 was appointed chief engineer of the New York City Board of Transportation.

❖ ❖ ❖

SHERMAN HATHORNE, for 30 years superintendent of the jobbing department of the Chicago Hardware Foundry Co., North Chicago, Ill., died last week in Jacksonville, Fla., aged 74 years. Mr. Hathorne retired from business in 1930.

❖ ❖ ❖

WILLIAM E. ARNDT, part owner of the Mohawk Mfg. Co., Detroit tool and die maker, was buried Dec. 20. Mr. Arndt was born in Berlin in 1873 and had lived in Detroit for 43 years.

❖ ❖ ❖

RALPH C. VELTE, vice-president in charge of sales, Valley Mould & Iron Corp., Hubbard, Ohio, died Dec. 20 at the age of 55 in a Youngstown, Ohio, hospital. He had been with Valley Mould & Iron for more than 20 years.

R. C. VELTE

Born in Mars, Pa., he first worked for companies in Pittsburgh before moving to Sharpsville and Sharon, and in 1927 to Youngstown.

❖ ❖ ❖

OTTO STUERZER, assistant director of the German branch of the International Harvester Co. at Duesseldorf, died on Dec. 15, aged 56 years. He joined the company in the Milwaukee factories in 1910.

THE Evercool Skimmer developed from efforts to improve malleable melting in our foundry. It has proved so much more satisfactory than the hand-made skimmers for removing slag from the bath that many foundries have taken licenses from us to use it.

The Evercool Skimmer with its water circulation through hollow head and handle can be used as long as needed to remove the slag. It saves skimming time as it need not be withdrawn for cooling or coating with fire clay. It skims the iron faster with less fatigue for the operator and better control of heats. Original equipment and normal replacements are without charge and our license agreement stipulates only a reasonable royalty.

We invite applications for licenses to use the Evercool Skimmer, protected by U. S. patents.

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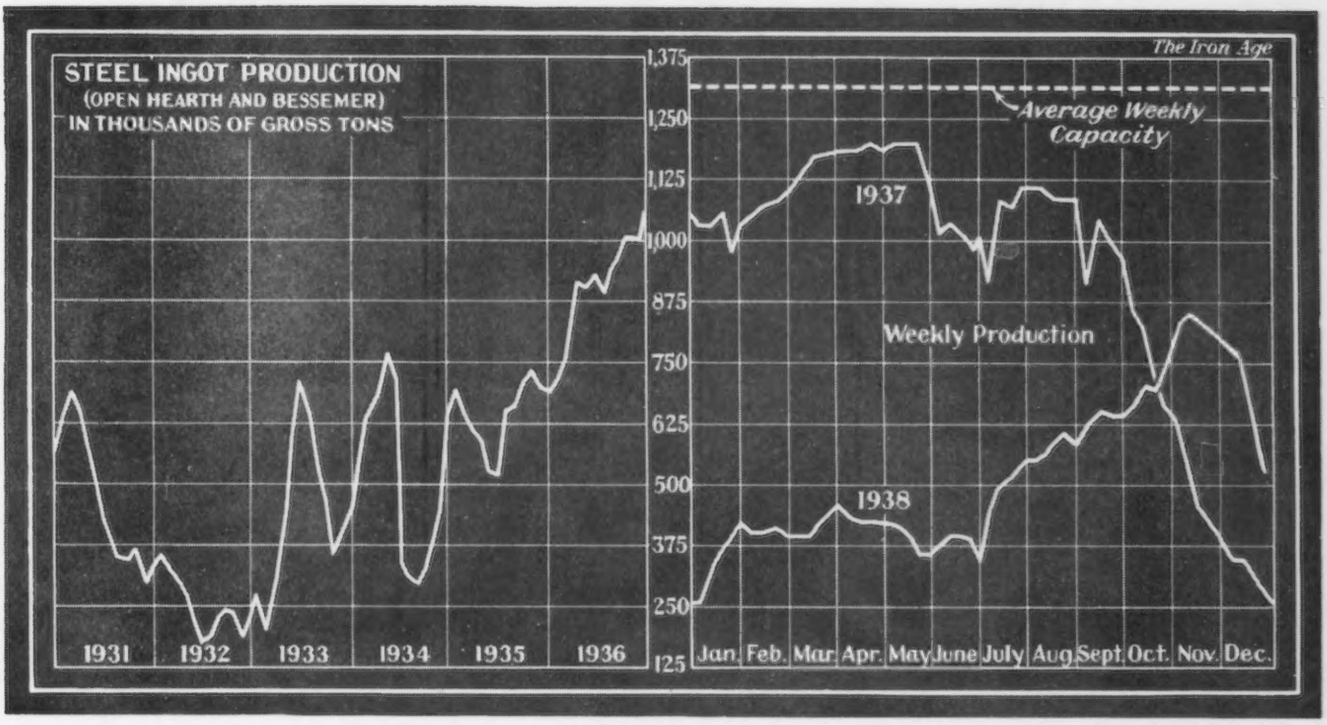
Griffin Wheel Co.
Illinois Malleable Iron Co.
International Harvester Co.
Lake City Malleable Co.
Lehigh Foundries
Lockport Fittings Co.
Muncie Malleable Foundry Co.
Walker Manufacturing Co.
Wisconsin-Appleton Co.

*U. S. Patents 1,763,637 1,827,503 1,827,504

BELLE CITY MALLEABLE IRON CO.
RACINE, WIS.

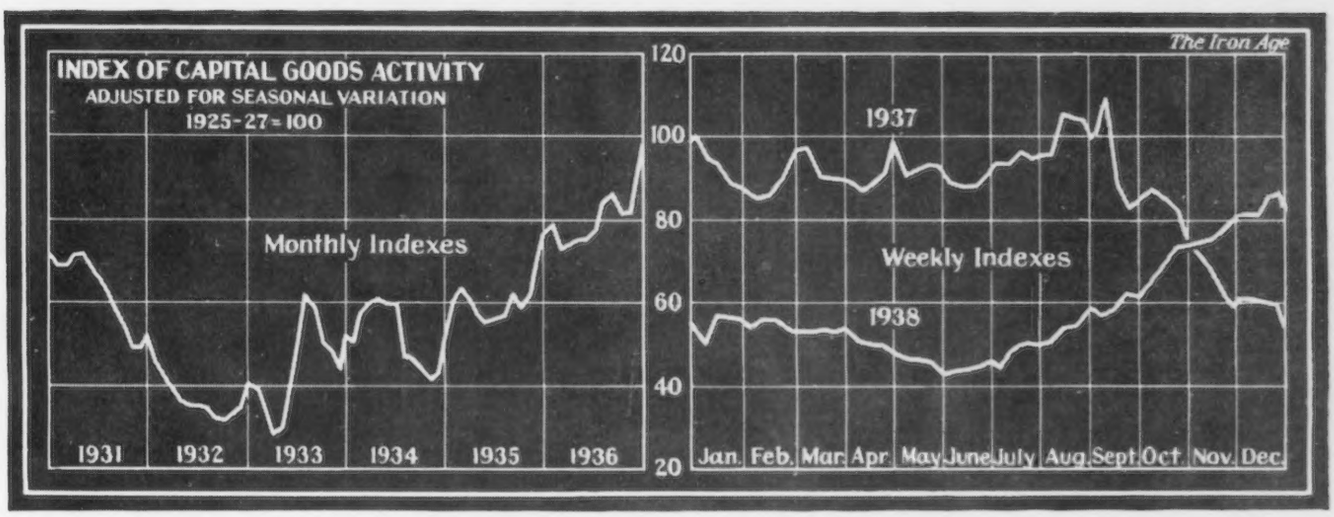
Ingot Output Drops 13 Points to 40 Per Cent



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Wheel-ing	Buffalo	Detroit	Southern	S. Ohio River	Western	St. Louis	East-ern	Aggre-gate
CURRENT WEEK.	28.0	48.0	32.0	27.0	34.0	62.0	36.0	75.0	54.0	49.0	33.0	42.0	63.0	40.0*
PREVIOUS WEEK..	39.0	56.0	42.0	34.0	49.0	74.0	43.0	90.0	68.0	63.5	40.0	59.0	75.0	53.0

*Allowance for holiday shutdowns.

Seasonal Slackening of Activity Lowers Index 2.5 Points



WITH the steel, automobile and Pittsburgh series showing the first effects of the usual year-end slackening of activity in the capital goods industries, THE IRON AGE index declined 2.5 points to 81 in the week ended Dec. 24. This is the first loss experienced by the index in 12 weeks. The heavy construction and the lumber carloading series moved contraseasonally higher for the week, but these gains were not sufficient to overcome the seasonal losses recorded by the other components of the index. The rise in the construction index was due to an unusually heavy volume of building awards. The total of these awards was $86,597,000, the highest weekly figure since the week of June 26, 1937.

	Week Ended Dec. 24	Week Ended Dec. 17	Comparable Week 1937	Comparable Week 1929
Steel ingot production[1]	86.3	94.7	36.0	57.5
Automobile production[2]	95.0	103.1	91.1	43.4
Construction contracts[3]	89.0	87.2	60.3	93.2
Forest products carloadings[4]	66.6	62.0	57.3	106.6
Production and shipments, Pittsburgh District[5]	67.9	70.5	53.5	101.1
Combined index	**81.0**	**83.5**	**59.6**	**80.4**

Sources: 1. THE IRON AGE; 2. Ward's Automotive Reports; 3. *Engineering News-Record;* 4. Association of American Railroads; 5. University of Pittsburgh.

. . . SUMMARY OF THE WEEK . . .

. . . Operations drop to 40 per cent in holiday week.

° ° °

. . . Moderately upward trend is expected in January.

° ° °

. . . Railroad buying one of the promising prospects.

UNDER the influence of year-end cautiousness in steel buying and affected by the holiday shutdown of all plants, ingot production this week will not exceed 40 per cent of the industry's capacity. A rebound to about 50 per cent is indicated for next week, when there will be no holiday shutdown.

While the trend of business and operations is expected to be upward during at least the first few months of the new year, the general belief is that strong improvement will not be in evidence until the latter part of January, when automobile companies probably will come into the market again for large tonnages.

Meanwhile, steel production in the first few weeks of the new year will be fairly well supported by recent orders for structural steel, reinforcing bars, rails and track accessories, material for railroad cars and an expected increase in tin plate requirements. If automobile production during the winter months comes up to expectations, the needs of this industry, together with larger rollings of steel for construction, the railroads, the can manufacturing industry and the increasingly important group of miscellaneous consumers, should be sufficient to support ingot production at 60 per cent or higher during a considerable part of the first quarter.

The steel industry is keenly interested in the proposals for railroad rehabilitation made by the special committee of railroad managements and labor, which if carried out constructively would mean much to both steel mills and equipment builders. Railroad managements admit the need of 100,000 cars and 2000 locomotives annually for at least the next five years if a reasonable solution of their problems can be found.

WITH large-scale railroad buying, the outlook for 1939 would be materially improved, as other major consuming channels, including automobiles, construction and can manufacture, promise to take substantially larger tonnages than in 1938.

This week's news contains a few suggestions of probable railroad needs. The Santa Fe has authorized the purchase of 30 diesel-electric locomotives at a cost of about $2,250,000 and the St. Louis-Southwestern has received court permission to expend $1,668,356 for various improvements. The Pittsburgh & West Virginia Railroad has asked for an RFC loan of $1,500,000 or guarantee of equipment trust certificates to purchase 600 steel hopper and 100 steel box cars requiring 6500 tons of steel. A few minor rail and accessory orders have been placed, including 3500 tons for the Illinois Central and 2824 tons for the Central of Georgia.

Construction steel awards and inquiries have been conspicuous in a week of comparatively light buying in other lines. Structural steel awards were nearly 41,000 tons.

As an example of the December decline in general steel buying Chicago mills report that orders this month are running from 10 to 25 per cent behind those of November.

AGITATION over steel mill wages has again reared its head, this time at the plant of the McKeesport Tin Plate Co., McKeesport, Pa., where the management has invoked the 20-day clause in its contract with the Steel Workers' Organizing Committee and has suggested wage reductions ranging from 6 to 16 per cent. The question is still under negotiation, but meanwhile poor tin plate business has recently forced the company to lay off about 800 of its 3000 employees.

This action follows the recent agreement of employees of the Follansbee Brothers Co. to accept wage reductions. Whether the movement will spread to other small or non-integrated sheet and tin plate makers who have been caught between low prices for their products and high wage scales, is not yet indicated.

An official statement of the Steel Workers' Organizing Committee says that 565 contracts have now been signed with iron and steel companies and allied fabricators. Of these 132 expire on miscellaneous dates, 238 were signed for a year or more and 132 have clauses providing for reopening at the request of either party. This "escape" clause, which is a feature of contracts held by some of the larger steel companies, precludes the possibility of general wage negotiations in February, as the original contracts provided.

SCRAP prices are unchanged, but the market has probably been strengthened by large purchases for export. Japan has begun the placing of orders for 100,000 tons or more and the European scrap cartel has bought about 100,000 tons, all at prices that are in line with present market conditions. THE IRON AGE scrap composite price remains at last week's figure of $14.92.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
Rails, heavy, at mill	$40.00	$40.00	$40.00	$42.50
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	43.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point.	34.00	34.00	34.00	37.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	37.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	37.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	43.00
Wire rods: Nos. 4 and 5, Pittsburgh, Chicago, Cleveland	43.00	43.00	43.00	47.00
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	2.10

Finished Steel

Cents Per Lb.:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.25	2.25	2.25	2.45
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.25
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.25
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.70	2.70	2.70	2.90
Alloy bars: Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton	2.80	2.80	2.80	3.00
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.15	2.15	2.15	2.40
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.95	2.95	2.95	3.20
Sheets, galv., No. 24: Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham	3.50	3.50	3.50	3.80
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.15	2.15	2.15	...
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.20	3.20	3.20	...

Cents Per Lb.:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
Wire nails: Pittsburgh, Chicago, Cleveland, Birmingham	2.45	2.45	2.45	2.75
Plain wire: Pittsburgh, Chicago, Cleveland, Birmingham	2.60	2.60	2.60	2.90
Barbed wire, galv.: Pittsburgh, Chicago, Cleveland, Birmingham	3.20	3.20	3.20	3.40
Tin plate, 100 lb. base box: Pittsburgh and Gary	$5.00	$5.00	$5.00	†$5.35

*Pittsburgh prices only.
†Subject to post-season adjustment.

Pig Iron

Per Gross Ton:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
No. 2 fdy., Philadelphia	$22.84	$22.84	$22.84	$25.76
No. 2, Valley furnace	21.00	21.00	21.00	24.00
No. 2, Southern Cin'ti	21.06	21.06	21.06	23.89
No. 2, Birmingham	17.38	17.38	17.38	20.38
No. 2, foundry, Chicago†	21.00	21.00	21.00	24.00
Basic, del'd eastern Pa.	22.34	22.34	22.34	25.26
Basic, Valley furnace	20.50	20.50	20.50	23.50
Malleable, Chicago†	21.00	21.00	21.00	24.00
Malleable, Valley	21.00	21.00	21.00	24.00
L. S. charcoal, Chicago	28.34	28.34	28.34	30.24
Ferromanganese, seab'd carlots	92.50	92.50	92.50	102.50

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
Heavy melting steel, P'gh.	$15.75	$15.75	$15.75	$14.25
Heavy melting steel, Phila.	15.25	15.25	14.75	14.25
Heavy melting steel, Ch'go.	13.75	13.75	14.25	12.75
Carwheels, Chicago	12.50	12.50	12.75	15.50
Carwheels, Philadelphia	16.75	16.75	16.75	16.25
No. 1 cast, Pittsburgh	15.50	15.50	15.50	16.25
No. 1 cast, Philadelphia	16.75	16.75	16.75	16.75
No. 1 cast, Ch'go (net ton)	12.50	12.50	12.50	12.50

Coke, Connellsville

Per Net Ton at Oven:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
Furnace coke, prompt	$3.75	$3.75	$3.75	$4.00
Foundry coke, prompt	4.75	4.75	4.75	5.00

Non-Ferrous Metals

Cents per Lb. to Large Buyers:	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, *1937
Copper, electrolytic, Conn.	11.25	11.25	11.25	10.125
Copper, lake, New York	11.375	11.375	11.375	11.125
Tin (Straits), New York	**46.50**	46.00	45.90	42.00
Zinc, East St. Louis	4.50	4.50	4.50	5.00
Zinc, New York	4.89	4.89	5.14	5.35
Lead, St. Louis	4.70	4.70	4.85	4.60
Lead, New York	4.85	4.85	5.10	4.75
Antimony (Asiatic), N. Y.	14.00	14.00	14.00	15.00

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
December 27, 1938	2.286 a Lb.	$20.61 a Gross Ton	$14.92 a Gross Ton
One week ago	2.286	20.61	14.92
One month ago	2.286	20.61	14.92
One year ago	2.512c.	23.25	13.75
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.	Based on average basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1938	2.512c., May 17	2.211c., Oct. 18	$23.25, June 21	$19.61, July 6	$15.00, Nov. 22	$11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 16
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 23
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.223c., Apr. 2	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.192c., Dec. 11	2.142c., July 10	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.402c., Jan. 4	2.212c., Nov. 1	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 17	13.08, Nov. 22

. . THIS WEEK'S MARKET NEWS . .

STEEL OPERATIONS

. . . Rate for last week of year estimated at 40%

THE rate of steel ingot production this week is estimated by THE IRON AGE at 40 per cent, making allowance for the Monday holiday. Owing to variations in plant schedules, it is difficult this week to arrive at an accurate estimate. Some plants resumed steel making Monday morning after the holiday shutdown, but others did not start up until Tuesday morning. The estimate of the American Iron and Steel Institute issued on Tuesday was 38.8 per cent.

As nearly all plants will make steel on New Year's Day, next week's estimate will be for a full week. Based on this week's production, the figure for the first week of the new year should be somewhere near 50 per cent.

DETROIT continues to be the brightest spot in steel production. If no allowance were made for the holiday, Ford Motor Co. would be making steel this week at an 80 per cent rate and the Great Lakes Steel Corp. at 100 per cent. Next Sunday Ford Motor Co. will put on one more open hearth, increasing to nine furnaces out of 10.

Ingot output at PITTSBURGH declined 11 points to 28 per cent; the WHEELING-WEIRTON district is down 12 points to 62 per cent; CHICAGO operations are off eight points to 48 per cent; the CLEVELAND-LORAIN average is down 15 points to 34 per cent; YOUNGSTOWN and nearby cities are down 10 points to 32 per cent, and there have been moderate reductions elsewhere. The BIRMINGHAM district is operating 17 furnaces against 18 last week.

PIG IRON

. . . Shipments taper off and new orders are few

THROUGHOUT the country the situation in pig iron markets during the past week has been pretty much the same—a tapering off in shipments and a scarcity of new orders.

Shipments have dropped off because of the desire to keep inventories at a minimum over the year end, but also because of the shutting down of a good many foundries for the entire holiday period.

During the first 20 days of December shipments by blast furnaces in the CLEVELAND and YOUNGSTOWN areas ran slightly ahead of those in the corresponding November period, but since Dec. 20 they have dropped off, and from all appearances the total December shipments by these furnaces will be about 10 per cent below the November volume. However, at PITTSBURGH total shipments in December probably will about equal those of November. Sanitary ware and heating equipment manufacturers in the PITTSBURGH district have been fairly busy.

In the ST. LOUIS arear small lots of pig iron were sold to the few melters who had not covered for their first quarter requirements. Shipments there have been keeping up at a good rate, with the prospect that they may exceed those of November.

Merchant pig iron producers are looking forward hopefully to the new year, but it is not expected that improvement in buying will come immediately as a good many foundries have fairly good stocks of iron either in their yards or under contract.

The Hamilton Iron & Coke Co. relighted a second stack Dec. 27. It will be on basic for the Middletown unit of American Rolling Mill Co. for a time and will change to merchant iron later.

NEW BUSINESS

. . . Year-end dullness does not dim good 1939 prospects

IN the weeks between now and late January or early February, when the business pattern for the first quarter is expected to assume its outlines, mills will be rolling and shipping tonnage carried over from fourth quarter, building up their stocks and preparing for a first half which will be good, and well ahead of the corresponding 1938 period.

Order books contain considerable railroad tonnage, construction material and tin plate orders, along with miscellaneous specifications placed in December for shipment in January. Automobile manufacturers . and parts makers are expected to enter the market some time during the next four to six weeks.

Optimism of both producers and consumers has increased during recent weeks, apparently through realization that the late December decline in business was mostly seasonal.

New business at PITTSBURGH in the past six days has dipped considerably in the aggregate but the decline has been due entirely to year-end factors. Quiet market conditions are anticipated during the remainder of this week and all of next as many consuming plants have shut down for a week or two. Major support in the current picture is coming from structural, railroad and semi-finished demand.

The Inland Steel Co. made a clean sweep of the steel for the first section of the CHICAGO subway, the award totaling about 8000 tons. Included were 4000 tons of reinforcing bars, 700 tons of shapes, and about 3300 tons of liner plates and rib beams. The second section, involving over 6000 tons of various types steel, will be bid Jan. 5.

CHICAGO sales officials do not expect much new business in the present week. After the turn of the year, however, a gradual upturn in farm equipment plant operations will be a favorable factor as will the increasing activity of railroad purchasing departments. Coupled with at least sustained automobile production and a probable rise in demand from miscellaneous consumers, these factors should result in improving business through the first quarter.

December bookings to date are running from 10 per cent to 25 per cent behind November in CHICAGO sales offices.

New tonnage has been good at BIRMINGHAM. Plate demand has been strong. Sheet tonnage also has been especially good.

PRICES

. . . Quotations on major products are firm

MILL prices on the major steel products are firm. A test of the flat rolled price structure may come with the placing of automobile tonnage in January.

Reinforcing bar prices as quoted by distributers have become weaker in some districts in the competition for tonnages resulting from a large volume of PWA projects on which Dec. 31 is the deadline.

Plate prices are firmer because of the insistence of many producers that

projects be identified more strictly, particularly where fabrication-in-transit rates are involved.

SEMI-FINISHED STEEL

. . . Sales holding up fairly well for this season

EXCEPT for the few days previous to the Christmas holidays, semi-finished steel bookings at PITTSBURGH were on a par with the previous week, with actual increases in some cases. Specifications involve sheet and tin plate bars, billets and slabs. Non-integrated makers' stocks are exceptionally low, indicating a resumption of buying immediately after the turn of the year.

Sales at CLEVELAND recently have been somewhat under producers' expectations but consumer inventories are low and if business warrants, buying will probably materialize toward the middle or latter part of January.

TIN PLATE

. . . Demand expected to increase soon

TIN plate operations have been off during the past week owing to the holidays and may be roughly estimated at 28 to 30 per cent on a weekly basis. Demand has shown some signs of increasing with tin plate makers exceptionally optimistic over first quarter prospects.

PLATES

. . . Inland Steel gets 3300 tons for Chicago subway

INLAND STEEL CO. was awarded 3300 tons of liner plates for the first section of the new CHICAGO subway. The next section, on which bids are to be taken shortly, will require about the same tonnage.

Plate inquiry in the CLEVELAND district is headed by 2000 tons for a Toledo, Ohio, pipe line.

New bids have been taken by the Metropolitan Water District, Los ANGELES, on aqueduct laterals, with alternate bids on reinforced concrete and steel pipe. If steel pipe is selected, 2523 tons will be required for the 7.2 miles of 22 and 37 in. pipe line. Previous bids were returned unopened.

The Bureau of Reclamation, DENVER, has awarded ring seal gates and conduit units for the Green Mountain Dam to the Koppers Co., Baltimore; about 335 tons of steel is required.

The Bureau of Supplies, Navy Department, will open bids Jan. 5 for 172 tons of medium hull plates for two harbor tugs to be built at the Charleston, S. C., Navy yard.

There has been a little better diversification of plate orders in the EAST, but tonnages are not large. CHICAGO producers are looking forward to the placing of 1000 tons of gondola cars by the Illinois Central, which will require about 10,000 tons of plates.

Market Sidelights

While activity of a majority of plants slackened sharply in the few days preceding Christmas, several stamping plants in the Cleveland district operated contrary to this trend. One company, specializing in airplane and automobile production, reports December operations comparable to the highest rate in its history and several others continued to work three shifts right up to Christmas.

* * *

The Bessemer, Ala., plant of the Pullman-Standard Car Mfg. Co. has finished an order of 2044 freight cars for the Southern Railway. It has on the books another order for 1300 cars, on which work will probably start the latter part of January.

* * *

R. E. Preston, St. Petersburg, Fla., has been awarded the contract to construct the new Birmingham, Ala., store of F. W. Woolworth & Co., which will represent an investment of over $400,000.

SHEETS AND STRIP

. . . Flat rolled manufacturers look to January for rise

MOST centers report business dull with automobile makers not expected to enter the market in a large way until late January. Production and delivery of cold strip and sheets have held up at CLEVELAND and YOUNGSTOWN on old orders but current buying, due to slackness in production of automobile parts, refrigerators, washing machines, stoves and other equipment, is light. PITTSBURGH reports some consumers short of stock so that some current inquiries request immediate delivery while CHICAGO finds total tonnage down and demand likely to slacken further although optimism for the 1939 sheet outlook is general.

Finished steel buying in SOUTHERN OHIO is light but galvanized demand is heavier than expected. Meanwhile the NEW YORK area expects little improvement until after the holidays but sees signs of betterment, including more active buying by stove makers.

STRUCTURAL STEEL

. . . Awards in the week total 40,800 tons

AWARDS of fabricated structural steel reported during the week totaled 40,800 tons, but inquiries are light, totaling less than 5000 tons. The largest lettings are 7500 tons for a bridge at Jamestown, R. I.; 6000 tons for a bridge at Portsmouth, N. H.; 5000 tons for a bridge at Owensboro, Ky.; 4180 tons for a gun assembly shop in Washington, and 3000 tons for a Navy shop at Alameda, Cal. Details of these and other awards will be found under the heading "Fabricated Steel" on another page.

General contracts have been let for foundations for bridges over the Mississippi River at Greenville, Miss., and Natchez, Miss., the superstructures of which will require 10,000 and 8000 tons of steel respectively. Bids for the steel have not yet been asked for.

RAILROAD BUYING

. . . Santa Fe to buy 30 diesel-electric locomotives

THE outstanding item of prospective railroad equipment purchasing is an authorization by the Atchison, Topeka & Santa Fe for 30 diesel-electric switching locomotives at an estimated cost of $2,250,000.

The 1939 budget of the St. Louis Southwestern Railway for improvements amounting to $1,668,356 (as listed in the Dec. 15 issue of THE IRON AGE) has been approved by the Federal Court at ST. LOUIS. The Wabash has been authorized by the court to spend $84,000 for the installation of automatic block signals between Foristell and Montgomery, Mo., 35 miles.

Some small rail orders have been placed. The Illinois Central has ordered 3500 tons of rails and accessories from the Tennessee Coal, Iron & Railroad Co., and the Central of Georgia has bought 2500 tons of rails and 324

tons of accessories from the same company.

The Magor Car Corp. has received an order from the Navy Department for 39 flat cars and one from the Board of Transportation, New York, for one crane car.

The Texas Pacific Railway has purchased one 600-hp. diesel-electric switch engine from the Electromotive Corp.

The Minnesota Transfer Railway has bought three diesel-electric switching locomotives from the American Locomotive Co.

The Pittsburgh & West Virginia Railroad has asked authority for an RFC loan of $1,500,000 or guarantee of equipment trust certificates of that value to purchase 600 steel hopper and 100 steel box cars, requiring about 6500 tons of steel. The equipment will cost $1,675,000.

TUBULAR GOODS

. . . Outlook in Dallas oil field fairly good

TUBULAR goods demand at PITTSBURGH remains steady with little or no change in aggregate bookings except for normal seasonal factors. Outlook in the Dallas oil fields is fairly bright for January and a resumption of oil-country goods business comparable to the early part of December is anticipated.

Pending the receipt of orders against 1939 oil company budgets, expected to start in January, specifications have been light recently at CLEVELAND and YOUNGSTOWN. Sales of standard pipe, however, have held up a little better than expected.

REINFORCING BARS

. . . 4000 Tons for Chicago Subway awarded to Inland

MILLS at PITTSBURGH and other points still are wading through a mass of inquiries involving Government-sponsored projects with bookings being made in fair volume. Inland Steel Co. has been awarded 4000 tons of bars for the first section of the Chicago subway, the second section of which will require 2750 tons of reinforcing steel.

Government projects have given some year-end impetus at CLEVELAND and YOUNGSTOWN, while inquiries in the NEW YORK district have been limited to small road mesh tonnages, with no large awards. The holiday has slowed business at most points. On the WEST COAST, Bethlehem Steel Co. has taken 850 tons for the Bureau of Reclamation, Odair, Wash. At Seattle, bids for the pontoon section of the $8,000,000 Lake Washington bridge, involving 8000 tons of bars, were above the bridge authority's estimate and were taken under advisement. Foundations of two bridges across the Mississippi River at Greenville and Natchez, Miss., each requiring 950 tons of reinforcing bars, were let.

SHIPBUILDING

. . . Two boats awarded to Pacific Coast yard

THE award of two freighters to Moore Drydock Co., Oakland Cal., by the United States Maritime Commission marks the return of commercial shipbuilding to the West Coast after an absence of many years. Pacific Coast yards have been unable to meet Eastern competition owing to the proximity of Eastern yards to sources of supply, and the present award was made under an amendment to the Merchant Marine Act of 1936 which provides that if the commission finds existing shipyards inadequate to meet requirement for purposes of national defense and national emergency, it may allocate tonnage "in such manner as it may determine to be fair, just and reasonable to all sections of the country."

Approximately 8740 tons of steel will be required for these two vessels.

WIRE PRODUCTS

. . . Holiday and year-end influences affect orders

MERCHANT wire demand at PITTSBURGH continues dull but on a daily basis manufacturers' wire requirements continue to hold up. The falling off in orders due to holiday influences is not as prolonged as had been expected, although a return to the rate of buying which occurred previous to the Christmas holidays is not expected at least for another week.

In the few days preceding Christmas, tonnage at CLEVELAND held at roughly the same level prevailing during the earlier part of the month. Probably the most notable development has been the increased optimism among users of manufacturers' wire. Producers report this better feeling has been increasing during the past six weeks. In the merchant division not much activity is expected until well after the start of 1939, in line with custom.

MERCHANT BARS

. . . Resumption of buying expected in New Year

CLEVELAND and YOUNGSTOWN bar sellers report the year is drawing to a close with buyers much more optimistic than at this time in 1937. The trade appears confident that the level of activity attained in late October and November will be regained and exceeded in February or March. Plow manufacturers are looking forward to a very good spring in many sections of the nation. Demand from the machinery industry and from forgers is expected to hold up well.

Year-end factors have influenced bar bookings at PITTSBURGH but support is expected soon from car builders who recently received awards. There are indications that diversification is expanding.

A moderate, but steady, interest in bars is cheering CHICAGO bar mills. Chief demand is from jobbers, forgers, cold drawers, automobile parts makers, and the farm equipment industry. The latter is expected to show more activity in the first quarter.

. . . CANADA . . .

. . . Railroad and industrial expenditures to aid market in 1939.

TORONTO, Dec. 27—Among the special announcements that will stimulate business early in the coming year is that by officials of the Canadian National Railways to the effect that tenders have been called for construction work on the uncompleted Montreal Terminal. During the next three years approximately $12,600,000 is to be spent on this project, of which between $3,000,000 and $4,000,000 will be spent during the coming 12 months.

Announcement is made by officials of Canadian Car & Foundry Co., Montreal, that preliminary work has started on extensive alterations to the Turcot plant to provide accommodations for manufacture of airplane parts. Company has purchased the old Davidson

foundry which will be used in connection with the project. The capital outlay will be approximately $150,000.

National Steel Car Corp., Hamilton, Ont., will sell 45,500 shares of stock to raise $150,000 for plant extensions in connection with airplane awards.

Considerable other business which will involve plant extensions and purchase of new equipment also is in prospect for early in the new year.

Sheet & Tube Buys Oil Supply Company

YOUNGSTOWN.—Frank Purnell, president of Youngstown Sheet & Tube Co., has been elected president of Emsco Derrick & Supply Co., Los Angeles, following acquisition of a substantial interest in Emsco by Sheet & Tube and by Republic Supply Co. of California.

It is understood Mr. Purnell will relinquish his new post upon selection and appointment of a machinery executive to take over the active management of Emsco, which has two plants at Los Angeles, one at Houston, and one at Dallas. The company makes derricks, pumps and other oil field machinery.

Youngstown Sheet & Tube and Republic Supply Co. purchased common stock holdings of E. M. Smith, president of Emsco, and bought shares from several other stockholders, at a price believed to be around $15 per share. Mr. Smith reportedly controlled around 200,000 shares.

Continental Supply Co., subsidiary of Youngstown Sheet & Tube, distributes Emsco products in mid-continent oil fields, while Republic Supply Co. is selling agent on the West Coast.

The new Emsco board includes, in addition to Mr. Purnell, W. J. Morris, president, Continental Supply Co., W. B. Gillies, operating vice-president of Sheet & Tube, and F. I. Brinegar, vice-president of Continental. Other members are W. D. Davidson, T. H. Beament and J. A. Crawford, representing Republic Supply interests and other shareholders.

McKeesport Tin Plate Cut Opposed By SWOC

PITTSBURGH. — McKeesport Tin Plate Co. and SWOC officials are continuing negotiations this week over the company's request for wage reductions ranging from six to 15 per cent although the 20-day clause invoked Dec. 6 by the company expired last Tuesday.

A strict interpretation of the contract would indicate that an agreement between the company and the union no longer exists, but efforts are being made to reach a compromise on the wage question. There is a possibility that the base rate for common labor of 62.5c. an hour may be maintained and individual adjustments made on wages in the higher brackets. Such a compromise would nominally maintain $5 a day wage but would effect reductions in other wage classifications.

At peak times the McKeesport company employs about 2200 men, but operations have been curtailed somewhat recently owing to the quietness in tin plate demand.

Tool Engineers Charter Two More Chapters

TWO more chapters will be chartered by the American Society of Tool Engineers in the next few weeks. One of these, at Elmira, N. Y., will take in the southern "tier" in New York State, while the second one will be chartered in Peoria, Ill. A new chapter in Moline, Ill, has already been chartered this month. The two additional chapters will bring the total to 26, scattered throughout the Industrial East and Middle West.

. GREAT BRITAIN .

. . . Welsh tin plate price for export announced.

LONDON, Dec. 27 (*By Cable*)—The Welsh tin plate export price for shipment after Jan. 1 has been announced as 20s. 3d. base IC f.o.b. for all destinations at c.i.f. rates.

Foundry and forge pig iron for delivery after Jan. 1 has been reduced 10s., making Cleveland No. 3 99s. delivered Cleveland zone.

Industrial Advertisers Group Offers Job Service

THE National Industrial Advertisers Association, 100 East Ohio Street, Chicago, has decided to continue the free employment service inaugurated last year. Companies seeking men for positions requiring knowledge and experience in advertising, marketing, sales promotion, research or publishing are invited to take advantage of this service. Such inquiries, directed to the headquarters office of the association, will be forwarded to the chapter of the association in the area from which the inquiry originates. The association now has 17 such chapters located in the principal industrial areas, with a total membership of over 1200.

The headquarters office maintains duplicates of all applications for positions received from its chapters, and in cases of inquiries from non-chapter areas, will supply the inquirer direct with names and information concerning applicants who appear to have the necessary qualifications. Individuals seeking positions in the fields mentioned are also invited to avail themselves of this service.

Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Dec. 27, 1938	Dec. 20, 1938	Nov. 29, 1938	Dec. 28, 1937	1938	1937
Fabricated structural steel awards	40,800	49,700	15,315	9,710	963,420	858,445
Fabricated plate awards	5,100	1,250	510	1,500	135,200	134,070
Steel sheet piling awards	200	1,000	300	1,825	50,185	60,955
Reinforcing bar awards	5,250	8,925	6,560	3,820	336,325	272,200
Total Letting of Construction Steel	51,350	60,875	22,685	16,855	1,485,130	1,325,670

FABRICATED STEEL

. . . Lettings decline to 40,800 tons from 49,700 tons last week . . . New projects call for only 4800 tons . . . Plate awards total 5100 tons.

NORTH ATLANTIC STATES

Awards

7500 Tons, Jamestown, R. I., bridge, to Harris Structural Steel Co., Plainfield, N. J. Merritt, Chapman & Scott Corp., contractors.

6000 Tons, Portsmouth, N. H., bridge, to Phoenix Bridge Co., Phoenixville, Pa.

4180 Tons, Washington, gun assembly shop building, to American Bridge Co., Pittsburgh.

1535 Tons, Garden City, New York, court house to American Bridge Co., Pittsburgh.

475 Tons, Trenton, N. J., court house, to Lehigh Structural Steel Co., Allentown, Pa.

435 Tons, Lockport, N. Y., two schools, to Ernst Iron Works, Buffalo.

423 Tons, Mount Vernon, N. Y., two apartment buildings, to Goodstein Iron & Steel Co., New York.

380 Tons, New York, Welfare Island dispensary, to American Bridge Co., New York.

306 Tons, Margaretville, N. Y., school, to James McKinney & Son, Albany, N. Y.

234 Tons, New York Deegan Boulevard to American Bridge Co., Pittsburgh.

210 Tons, Corona, L. I., health center, to American Bridge Co., Pittsburgh.

170 Tons, Lawrence, Mass., two bridges, to Bethlehem Steel Co., Bethlehem, Pa.

150 Tons, Elmira, N. Y., school No. 5, to American Bridge Co., Pittsburgh.

150 Tons, Newark, Del., buildings, University of Delaware, to Max Corcoran, Philadelphia.

125 Tons, Easton, Pa., addition to Woolworth store, to Bethlehem Contracting Co., Bethlehem, Pa.

125 Tons, Mahoning Dam, Pa., bulkhead beams, etc., to Dravo Corp., Pittsburgh.

120 Tons, Bloomsburg, Pa., Red Rock bridge, to American Bridge Co., Pittsburgh.

105 Tons, New York, staff house, Lincoln Hospital, to Dreier Structural Steel Co., New York.

100 Tons, Falmouth, Mass., two bridges, to American Bridge Co., Pittsburgh.

THE SOUTH

5000 Tons, Owensboro, Ky., Ohio River bridge, to Hunter Steel Co., Pittsburgh.

1741 Tons, Oklahoma and Texas, Red River bridge, to Patterson Steel Co., Tulsa, Okla.

350 Tons, Lee and Burleson counties, Tex., State bridges, to Mosher Steel Co., Dallas, Tex.

290 Tons, College Station, Tex., dining hall, to Austin Brothers, Dallas, Tex.

235 Tons, Bryan County, Ga., State bridge, to Virginia Bridge Co., Roanoke.

110 Tons, Covington, Ky., 4th District School, to American Bridge Co., Pittsburgh.

110 Tons, Owingsville, Ky., high school, to American Bridge Co., Pittsburgh.

100 Tons, Mobile, Ala., building, to Virginia Bridge Co., Roanoke, Va.

CENTRAL STATES

1300 Tons, Kansas City, Kan., West Kansas Avenue bridge, to Kansas City Structural Steel Co., Kansas City, Kan.

920 Tons, Monroe County, Wis., bridge, to Milwaukee Bridge Co., Milwaukee.

845 Tons, Lead, S. D., pressure building for Homestake Mining Co., to Worden-Allen Co., Milwaukee.

700 Tons, Chicago, subway section S5, to Inland Steel Co., Chicago, through Herlihy Construction Co.

645 Tons, Detroit, outer drive grade separation, to American Bridge Co., Pittsburgh.

500 Tons, Kent, Ohio, McGilvrey Hall, Kent State University, to Burger Iron Works, Akron, Ohio, through Carmichael Construction Co.

460 Tons, Detroit, bottling works extension, Pfeiffer Brewing Co., to R. C. Mahon Co., Detroit.

380 Tons, Youngstown, Ohio, extension to Isaly Dairy, to Ohio Structural Steel Co., Newton Falls, Ohio.

350 Tons, Detroit, Hinde & Dauch factory building, to an unnamed bidder.

278 Tons, Milwaukee, building for Gallun & Sons, to Lakeside Bridge Co., Milwaukee.

245 Tons, Bloomington, Ohio, women's dormitories, to Central States Bridge & Structural Co., Dayton, Ohio.

220 Tons, State of Minnesota, Duluth ore spouts, to American Bridge Co., Pittsburgh.

175 Tons, Marion, Mich., State Bridge, to Bethlehem Steel Co., Bethlehem, Pa.

150 Tons, State of Nebraska, Keystone Spillway, to Omaha Steel Works, Omaha.

140 Tons, Johnson County, Ill., KSH bridge FAGH 139, to Midland Structural Steel Co., Cicero, Ill.

110 Tons, Hardin County, Ill., KSH bridge FAGH 139, to Midland Structural Steel Co., Cicero, Ill.

WESTERN STATES

3000 Tons, Alameda, Cal., Navy shop, to Bethlehem Steel Co., San Francisco.

1100 Tons, San Diego, Cal., Navy shop addition, to National Iron Works, San Diego revised tonnage).

935 Tons, Yellowstone Park, Wyo., bridge, to J. B. Klein Iron & Foundry Co., Oklahoma City.

438 Tons, Bakersfield, Cal., overhead crossing, to Consolidated Steel Corp., San Francisco.

133 Tons, Pompey's Pillar, Mont., overpass, to Bethlehem Steel Co., Bethlehem, Pa.

105 Tons, Roosevelt County, Mont., bridge No. 253D, to American Bridge Co., Pittsburgh.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

700 Tons, Marcus Hook, Pa., and Toledo, Ohio, case structures, Sun Oil Co.

675 Tons, Salem, N. J., warehouse, Anchor Hocking Glass Corp.

530 Tons, Fort Jay, N. Y., Government buildings.

525 Tons, Plainfield, Conn., State bridge over Mosey's River.

336 Tons, Warren County, N. Y., includes 94 tons reinforcing bars, highway project S.H. 1963. Bero Engineering & Construction Corp., North Tonawanda, N. Y., low on general contract (previously reported).

260 Tons, Binghamton, N. Y., hospital building.

250 Tons, Pittsburgh, Nurses' Home, Elizabeth Steel Magee Hospital.

230 Tons, Genesee, N. Y., school building.

230 Tons, Delaware County, N. Y., highway project R.C. 4010, Mohawk Paving Co., Inc., Buffalo, low on general contract (previously reported).

180 Tons, Mahwah, N. J., factory, American Brake Shoe & Foundry Co.

175 Tons, Potter Township, Pa., infirmary.

145 Tons, Dutchess County, N. Y., includes 54 tons reinforcing bars, highway project R.C. 4011, Ralph Myers, Salem, Ind., low on general contract (previously reported).

143 Tons, Orange County, N. Y., highway project R.C. 2559; bids until Jan. 17, by Department of Public Works, Albany, N. Y.

THE SOUTH

250 Tons, Gilbertsville Dam, Ky., girder and beam spans, TVA.

CENTRAL STATES

120 Tons, Ottawa, Ohio, beam bridge.

120 Tons, Wyandotte, Mich., power house addition.

WESTERN STATES

5900 Tons, Mare Island, Cal., Navy shop; American Bridge Co., Pittsburgh, low bidder (previously reported).

1367 Tons, Seattle, Wash., pontoon section of Lake Washington bridge; Puget Sound Bridge & Dredging Co., Seattle, J. H. Pomeroy & Co., San Francisco, and Parker-Schram Co., Portland, joint low bidders on general contract (previously reported).

1200 Tons, Bremerton, Wash., caisson gate; Winslow Marine Railway & Shipbuilding Co., Seattle, low bidder (previously reported).

435 Tons, Billings, Mont., Senior High School.

200 Tons, Parker, Colo., State highway bridge.

FABRICATED PLATES

AWARDS

3300 Tons, Chicago, subway section S5, tunnel liner plates, to Inland Steel Co., Chicago; through Herlihy Construction Co.

335 Tons, Kremmling, Colo., gates and conduit units for Green Mountain Dam (Specification 811), to Koppers Co., Baltimore.

484 Tons, Louisville, Ky., barges for Aetna Oil Service, Inc., to Nashville Bridge Co., Nashville, Tenn.

100 Tons, Industry, N. Y., steel standpipe, to Pittsburgh Des Moines Steel Co., Pittsburgh.

205 Tons, steel mooring buoys, to Gary Steel Products Co., Gary, Ind.

510 Tons, Leetsdale, two oil barges to Nashville Bridge Co., Nashvlile, Tenn.

150 Tons, Detroit, storage tanks, to Chicago Bridge & Iron Co., Chicago.

PENDING PROJECTS

2523 Tons, Los Angeles, aqueduct laterals for Metropolitan Water District (concrete alternate); bids taken on readvertisement.

2000 Tons, Toledo, Ohio, city pipe line.

400 Tons, Bethlehem, Pa., welded pipe line for city; bids in.

SHEET PILING

AWARDS

200 Tons, Morgan County, Ohio, project 270 to Carnegie-Illinois Steel Corp., Pittsburgh.

PENDING PROJECTS

1200 Tons, Greenville, Miss., foundation for bridge across Mississippi River, Massman Construction Co., Kansas City, general constractor.

. . . NON-FERROUS . . .

. . . Lead buying continues in heavy volume . . . Foreign prices firmer and fractionally higher.

A PRE-HOLIDAY dullness, added to the persistent inclination of domestic buyers to remain on the sidelines while the present disparity between domestic and foreign quotations exists, produced one of the dullest weeks the domestic market has experienced in some time. Export sales of the red metal, however, were at a slightly higher level, despite the absence of the usual Japanese support, and foreign prices ended the week noticeably firmer than in the preceding period. Little new activity is expected until after the holidays and then the trend of foreign prices will be the determining factor in the course pursued by the domestic market. The domestic price level remains unchanged with producers quoting 11.25c. per lb., Connecticut Valley, for electrolytic metal.

Lead

The buying wave which started two weeks ago continued unabated in the past week, with many sellers reporting the highest weekly sales total of any week so far this year. The buying was well diversified and primarily for January delivery at the unchanged price basis of 4.70c. per lb., St. Louis. The foreign price ended the week at 3.15c. per lb., a gain of three points over the price prevailing at the beginning of the week.

Zinc

Outside of a modest amount of first quarter covering, there was very little business done in the spelter market in the past week. Shipments, which over the past month have been the only active phase of the market, have been retarded by the inventory period, but are still substantially in excess of the rate of new orders. The domestic price situation is unchanged with 4.50c. per lb. for prime Western metal firmly established. The foreign price closed the week at about 2.91c. per lb., against 2.85c. at the start of the week.

Tin

A fairly active demand from tin plate makers for first quarter supplies was the chief feature of the market in the past week. Prices advanced to 46.50c. per lb., New York, for Straits metal on Friday, from a low of 46c. on Monday. The London price also moved into higher ground, with cash standards priced at £215 on Friday, as against £213 15s. on Tuesday. As Tuesday is a holiday in both London and Singapore, interest in the domestic market on that day was nil and quotations nominal.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Dec. 21	Dec. 22	Dec. 23	Dec. 24	Dec. 27
Copper, Electrolytic[1]	11.25	11.25	11.25	11.25	11.25
Copper, Lake	11.375	11.375	11.375	11.375	11.375
Tin, Straits, New York	....	46.00	46.25	46.50	46.50
Zinc, East St. Louis[2]	4.50	4.50	4.50	4.50	4.50
Lead, St. Louis[3]	4.70	4.70	4.70	4.70	4.70

[1] Delivered Conn. Valley, deduct ¼c. for New York delivery. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Prices

Base per lb., Delivered

	New York	Cleveland
Tin, Straits pig	47.50c.	49.75c.
Copper, lake	12.25c.	12.375c.
Copper, electro	11.50c.	12.375c.
Copper, castings	11.25c.	11.875c.
*Copper sheets, hot-rolled	19.375c.	19.375c.
*High brass sheets	17.31c.	17.31c.
*Seamless brass tubes	20.06c.	20.06c.
*Seamless copper tubes	19.875c.	19.875c.
*Brass rods	12.62c.	12.62c.
Zinc slabs	6.25c.	7.25c.
Zinc sheets, No. 9 casks	10.50c.	12.10c.
Lead, American pig	5.60c.	5.60c.
Lead, bar	6.275c.	8.50c.
Lead, sheets, cut	8.00c.	8.00c.
Antimony, Asiatic	15.00c.	17.75c.
Alum., virgin, 99 per cent plus	22.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.50c.	19.50c.
Solder, ½ and ½	28.80c.	29.10c.
Babbitt metal, commercial grade	22.75c.	22.50c.

* These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/3; on brass sheets and rods, 40, and on brass and copper tubes, 25.

Old Metals Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.00c.	8.75c.
Copper, hvy. and wire	7.00c.	7.50c.
Copper, light and bottoms	6.25c.	6.50c.
Brass, heavy	4.25c.	4.75c.
Brass, light	3.375c.	4.125c.
Hvy. machine composition	6.125c.	7.625c.
No. 1 yel. brass turnings	4.125c.	4.625c.
No. 1 red brass or compos. turnings	5.875c.	6.50c.
Lead, heavy	3.625c.	4.50c.
Cast aluminum	7.00c.	8.25c.
Sheet aluminum	11.75c.	13.25c.
Zinc	2.25c.	3.50c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered; virgin 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt, No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt, New York; Asiatic, 14c. a lb., f.o.b.; American, 11.25c. a lb. QUICKSILVER, $77 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 11c. a lb. lcl.

World's Largest Heavy Tube Plant Starts Operation

LONDON (*By Mail*).—The world's largest heavy tube plant was inaugurated recently at the Chesterfield Tube Co.'s works, Chesterfield, by Lord Stanhope, First Lord of the Admiralty. The new plant has been designed for the manufacture of weldless steel tubular products having a maximum external diameter of 54 in. and an approximate finished weight of 18 tons.

While the plant has been laid down principally for commercial requirements, it will be of great value to the Government. Its operation, it is claimed, will insure that Britain will no longer be dependent upon foreign sources for the manufacture and supply of heavy caliber pierced and drawn steel hollows.

IRON AND STEEL SCRAP

. . . Composite again unchanged at $14.92, with dullness prevailing in most markets . . . New export orders from Europe and the Orient.

DEC. 27.—With year-end dullness prevailing throughout the country, the price of No. 1 heavy melting steel remains unchanged in all district markets, with the composite price at $14.92 for the third week. A few miscellaneous grades are stronger at Pittsburgh, and many railroad specialties are stronger at St. Louis, following the sale of several thousand tons of heavy melting steel and other items to a local steel mill. No. 1 steel is still going into consumption at around $16 a ton at some mills in the Pittsburgh area, so that no signs of weakness are apparent.

The European scrap cartel placed an order for about 100,000 tons of scrap in the American market last week at about $15 f.a.s., and the Japanese made initial purchases on a lot that will eventually total over 100,000 tons. Meanwhile dealer export buying prices are unchanged. November shipments of scrap reported by the Department of Commerce showed a sharp gain over those of October, 450,000 tons being reported for November as against 223,954 for the previous month. The leading consumer was Japan, to which was shipped 319,934 tons, with Italy second at 55,446 tons and Germany third at 30,515 tons.

New York

Last week the European scrap cartel purchased about 100,000 tons of scrap from American dealers at a price understood to be around $15 f.a.s. for the No. 1 grade. Some initial purchases were also made by Japanese buying houses on a lot that will probably total well over 100,000 tons before the week is out. Shipments to Japan are assuming large proportions as the year comes to a close. November shipments to Japan alone were 50 per cent more than all of October's shipments, according to the latest report of the Department of Commerce. Meanwhile, the market here is relatively quiet, with prices unchanged but on the strong side. Domestic shipments from this area are negligible.

Pittsburgh

Total transactions have been off somewhat in the past week because of holiday factors but current quotations on major scrap grades remain unchanged. Further clarification of the market trend is expected in a few weeks. Meanwhile, No. 1 heavy melting steel continues to go into consumption at around $16 a ton at some points in the district.

Chicago

Lack of mill interest here in the past week has held the heavy melting quotation to $13.50 to $14. Sales are not anticipated until January as mill operations will be reduced until that time.

Youngstown

Mills have held up shipments over the holidays and very little activity in scrap is looked for until after Jan. 1. Reports from the East of a large export sale have helped sentiment here.

Cleveland

Decreased open-hearth activity here over Christmas added to the quiet condition of the scrap market. Nevertheless, published quotations have not weakened. There has been some movement recently of heavy scrap obtained from the defunct Lake Shore Electric Railway.

Buffalo

The scrap market is quiet this week with no expectation of a change until after the first of the year. No. 1 heavy melting steel continues to sell for $13.75 to $14.25 with No. 2 material $2 under that figure. Coming inventories have reduced scrap piles to a minimum. Movements of cast scrap have slacked off considerably.

Cincinnati

Year end quietness reigns in the district old materials market. Some steel grades are moving on contract, but new commitments are totally absent. Little activity is expected until after Jan. 1, and dealers are sustaining the present market in anticipation of New Year improvement.

St. Louis

The sale of several thousand tons of heavy melting steel and other items to a local steel mill, and the prospect of other sales early in the year has strengthened the scrap iron market. No. 1 locomotive tires and miscellaneous standard section rails are 50c. a ton higher and steel rails under 3 ft. and brake shoes 75c. up. Bundled sheets, cast borings and turnings, machine shop turnings and steel car axles are 50c. down and No. 2 wrought is 25c. lower. Railroad lists: St. Louis Southwestern, 240 tons; Pennsylvania, 16,000 tons.

Detroit

Although Detroit's steel production continues this week at 90 per cent of capacity on a daily basis, consumers are temporarily not in the market for scrap. As a result of this and as a reflection from current weakness in other markets, scrap sentiment is definitely off. However, there has been litle trading in the last week and it is impossible to give any indication in terms of price. Numerous automotive lists will close during the current week, most of them on Thursday and Friday. Prices are expected to be lower, but not seriously so.

Boston

With the recent purchase of 100,000 tons of scrap by the European scrap cartel, presumably for Italy, the export market has taken on a new lease of life. However, shippers find it increasingly difficult to dislodge strictly No. 1 steel, and therefore are plugging on the cream of No. 2 steel offerings. No exports of heavy melting steel were reported from this port the past week. The American Steel & Wire Co., Worcester, is in the market for an indefinite tonnage of steel scrap. Against this inquiry brokers are offering $12.50 a ton on cars central New England points for No. 1 steel, and $11.50 for No. 2, while in the Providence district they will pay $13 a ton on cars for No. 1. However, the Washburn Wire Co. is offering $14 to $14.50 a ton delivered for No. 1 steel. For Pennsylvania consumption the market currently is flat.

Philadelphia

The market throughout this area is sunk in a conventional between-holidays lethargy. A little material is moving into district mills on old orders, and the export market is enlivened only by sporadic purchases from dealers. Although remaining practically unaltered, the entire price list is fundamentally untested and badly in need of new business in order to have quotations verified. Sentiment among dealers and brokers is either confused or tending on the down side. Budd will take bids on a January list of 40,000 tons of compressed sheets late this week, which bids will most likely be little, if any, better than those entered last month.

Court Absolves Republic Officials

CLEVELAND.—Officers and directors of Republic Steel Corp. have been absolved of charges growing out of stock purchases totaling $2,500,000, in a decision by Common Pleas Judge Frank J. Lausche. In a 300-page ruling the judge dismissed charges of "secret profits, personal gain and bad faith," brought by attorneys for five stockholders.

Judge Lausche held there had been no effort on the part of the directors to profit personally from the move by which Republic purchased stock during a proxy fight. Attorneys for the five stockholders intimated a review of the decision might be sought in a higher court, but said no definite decision had been reached.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$15.50 to	$16.00
Railroad hvy. mltng..	16.00 to	16.50
No. 2 hvy. mltng. steel.	14.25 to	14.75
Scrap rails	16.50 to	17.00
Rails 3 ft. and under..	17.00 to	17.50
Comp. sheet steel	15.50 to	16.00
Hand bundled sheets..	14.50 to	15.00
Hvy. steel axle turn..	14.00 to	14.50
Machine shop turn....	9.75 to	10.25
Short shov. turn.....	10.50 to	11.00
Mixed bor. & turn....	8.25 to	8.75
Cast iron borings.....	8.25 to	8.75
Cast iron carwheels...	15.00 to	15.50
Hvy. breakable cast...	12.50 to	13.00
No. 1 cupola cast.....	15.25 to	15.75
RR. knuckles & cplrs.	16.50 to	17.00
Rail coil & leaf springs	17.00 to	17.50
Rolled steel wheels....	17.00 to	17.50
Low phos. billet crops.	18.00 to	18.50
Low phos. punchings.	17.00 to	17.50
Low phos. plate	16.75 to	17.25

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$15.00 to	$15.50
No. 2 hvy. mltng. steel.		13.50
Hydraulic bund., new.	14.50 to	15.00
Hydraulic bund., old..	11.50 to	12.00
Steel rails for rolling.	17.00 to	17.50
Cast iron carwheels...	16.50 to	17.00
Hvy. breakable cast...	....	16.00
No. 1 cast.....	16.50 to	17.00
Stove plate (steel wks.)	13.00 to	13.50
Railroad malleable ...	15.50 to	16.00
Machine shop turn....	8.50 to	9.00
No. 1 blast furnace....	6.50 to	7.00
Cast borings	6.50 to	7.00
Heavy axle turnings..	10.00 to	10.50
No. 1 low phos. hvy...	16.50 to	17.00
Couplers & knuckles..	16.50 to	17.00
Rolled steel wheels ...	16.50 to	17.00
Steel axles	21.50 to	22.00
Shafting	20.00 to	20.50
Spec. iron & steel pipe	12.00 to	12.50
No. 1 forge fire	11.00 to	11.50
Cast borings (chem.)..	9.50 to	10.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton	
Hvy. mltng. steel	$13.50 to	$14.00
Auto. hvy. mltng. steel alloy free	12.00 to	12.50
No. 2 auto. steel	11.50 to	12.00
Shoveling steel	13.50 to	14.00
Factory bundles	12.75 to	13.25
Dealers' bundles	12.00 to	12.50
Drop forge flashings..	11.50 to	12.00
No. 1 busheling	12.00 to	12.50
No. 2 busheling, old..	5.75 to	6.25
Rolled carwheels	15.25 to	15.75
Railroad tires, cut....	16.25 to	16.75
Railroad leaf springs..	15.75 to	16.25
Steel coup. & knuckles	15.25 to	15.75
Axle turnings	12.75 to	13.25
Coil springs	16.75 to	17.25
Axle turn. (elec.)	13.75 to	14.25
Low phos. punchings..	15.75 to	16.25
Low phos. plates 12 in. and under	15.25 to	15.75
Cast iron borings	5.25 to	5.75
Short shov. turn.	7.00 to	7.50
Machine shop turn....	7.00 to	7.50
Rerolling rails	17.00 to	17.50
Steel rails under 3 ft..	15.75 to	16.25
Steel rails under 2 ft..	16.25 to	16.75
Angle bars, steel	15.25 to	15.75
Cast iron carwheels...	12.25 to	12.75
Railroad malleable	14.75 to	15.25
Agric. malleable	11.25 to	11.75
	Per Net Ton	
Iron car axles	19.50 to	20.00
Steel car axes	19.00 to	19.50
Locomotive tires	15.25 to	15.75
Pipes and flues	9.25 to	9.75
No. 1 machinery cast.	12.25 to	12.75
Clean auto. cast.	12.25 to	12.75
No. 1 railroad cast....	11.25 to	11.75
No. 1 agric. cast.....	10.75 to	11.25
Stove plate	8.25 to	8.75
Grate bars	8.25 to	8.75
Brake shoes	9.25 to	9.75

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$15.00 to	$15.50
No. 2 hvy. mltng. steel.	13.75 to	14.25
Low phos. plate	15.50 to	16.00
No. 1 busheling	13.50 to	14.00
Hydraulic bundles	14.25 to	14.75
Machine shop turn....	9.75 to	10.25

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$14.00 to	$14.50
No. 2 hvy. mltng. steel.	13.50 to	14.00
Comp. sheet steel	13.50 to	14.00
Light bund. stampings	11.00 to	11.50
Drop forge flashings..	13.00 to	13.50
Machine shop turn....	7.00 to	7.50
Short shov. turn.....	7.50 to	8.00
No. 1 busheling	13.00 to	13.50
Steel axle turnings....	11.00 to	11.50
Low phos. billet and bloom crops	18.00 to	18.50
Cast iron borings	7.75 to	8.25
Mixed bor. & turn....	7.75 to	8.25
No. 2 busheling	7.75 to	8.25
No. 1 cast	16.50 to	17.00
Railroad grate bars ..	9.50 to	10.00
Stove plate	10.00 to	10.50
Rails under 3 ft.	19.00 to	19.50
Rails for rolling	17.00 to	17.50
Railroad malleable ...	15.50 to	16.00
Cast iron carwheels ..	14.00 to	14.50

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$13.75 to	$14.75
No. 2 hvy. mltng. steel.	11.75 to	12.25
Scrap rails	15.00 to	15.50
New hvy. b'ndled sheets	11.75 to	12.25
Old hydraul. bundles..	10.75 to	11.25
Drop forge flashings...	11.75 to	12.25
No. 1 busheling	11.75 to	12.25
Hvy. axle turnings....	10.50 to	11.00
Machine shop turn....	6.75 to	7.25
Knuckles & couplers..	16.50 to	17.00
Coil & leaf springs....	16.50 to	17.00
Rolled steel wheels....	16.00 to	16.50
Low phos. billet crops.	15.50 to	16.00
Shov. turnings	8.75 to	9.25
Mixed bor. & turn.....	7.50 to	8.00
Cast iron borings	7.50 to	8.00
Steel car axles	16.50 to	17.00
No. 1 machinery cast..	15.50 to	16.00
No. 1 cupola cast.	14.50 to	15.00
Stove plate	13.00 to	13.50
Steel rails under 3 ft..	18.00 to	18.50
Cast iron carwheels...	13.50 to	14.00
Railroad malleable	15.00 to	15.50
Chemical borings	9.00 to	9.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting.	$13.00 to	$13.50
No. 1 hvy. melting....	13.00 to	13.50
No. 2 hvy. melting....	12.00 to	12.50
No. 1 locomotive tires.	13.50 to	14.00
Misc. stand. sec. rails.	14.50 to	15.00
Railroad springs	15.50 to	16.00
Bundled sheets	7.50 to	8.00
No. 1 busheling	7.50 to	8.00
Cast. bor. & turn.....	3.50 to	4.00
Machine shop turn....	4.00 to	4.50
Heavy turnings	9.50 to	10.00
Rails for rolling	17.00 to	17.50
Steel car axles	18.50 to	19.00
No. 1 RR. wrought....	10.50 to	11.00
No. 2 RR. wrought....	12.50 to	13.00
Steel rails under 3 ft..	16.25 to	16.75
Steel angle bars	14.50 to	15.00
Cast iron carwheels...	14.00 to	14.50
No. 1 machinery cast..	14.50 to	15.00
Railroad malleable ...	12.00 to	12.50
No. 1 railroad cast....	12.75 to	13.00
Stove plate	9.00 to	9.50
Grate bars	8.50 to	9.00
Brake shoes	10.75 to	11.25

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel.	$11.50 to	$12.00
No. 2 hvy. mltng. steel.	9.25 to	9.75
Scrap rails for mltng.	15.25 to	15.75
Loose sheet clippings.	6.75 to	7.25
Hydrau. b'ndled sheets	11.00 to	11.50
Cast iron borings	4.00 to	4.50
Machine shop turn....	5.25 to	5.75
No. 1 busheling	8.00 to	8.50
No. 2 busheling	2.75 to	3.25
Rails for rolling	17.50 to	18.00
No. 1 locomotive tires.	14.25 to	14.75
Short rails	18.00 to	18.50
Cast iron carwheels...	12.75 to	13.25
No. 1 machinery cast.	13.50 to	14.00
No. 1 railroad cast....	12.75 to	13.25
Burnt cast	6.75 to	7.25
Stove plate	6.75 to	7.25
Agricul. malleable	11.75 to	12.25
Railroad malleable	14.25 to	14.75
Mixed hvy. cast.....	10.50 to	11.00

BIRMINGHAM

Per gross ton delivered to consumer:

Hvy. melting steel....	$12.50 to	$14.00
Scrap steel rails	14.50 to	15.00
Short shov. turnings..	7.50 to	8.10
Stove plate	9.00 to	10.00
Steel axles	15.00 to	16.00
Iron axles	15.00 to	16.00
No. 1 RR. wrought	....	10.00
Rails for rolling	16.00 to	16.50
No. 1 cast.	....	14.50
Tramcar wheels	....	14.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	$10.50 to	$11.00
No. 2 hvy. mltng. steel.	9.00 to	9.50
Borings and turnings.	5.75 to	6.25
Long turnings	5.50 to	6.00
Short shov. turnings..	6.00 to	6.50
No. 1 machinery cast..	12.25 to	12.75
Automotive cast	13.50 to	14.00
Hvy. breakable cast...	9.75 to	10.25
Hydraul. comp. sheets.	11.75 to	12.25
Stove plate	8.00 to	8.50
New factory bushel...	10.75 to	11.25
Sheet clippings	8.25 to	9.25
Flashings	9.00 to	9.50
Low phos. plate scrap	12.00 to	12.50

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel.	$10.50 to	$11.00
No. 2 hvy. mltng. steel.	9.00 to	9.50
Hvy. breakable cast...	12.00 to	12.50
No. 1 machinery cast.	11.50 to	12.00
No. 2 cast	9.50 to	10.00
Stove plate	9.50 to	10.00
Steel car axles	20.00 to	20.50
Shafting	15.50 to	16.00
No. 1 RR. wrought....	11.00 to	11.50
No. 1 wrought long....	9.50 to	10.00
Spec. iron & steel pipe	9.00 to	9.50
Rails for rolling	16.00 to	16.50
Clean steel turnings*..	4.00 to	4.50
Cast borings*	3.50 to	4.00
No. 1 blast furnace...	3.50 to	4.00
Cast borings (chem.)..	9.50 to	10.00
Unprepared yard scrap	6.00 to	6.50
Light iron	3.00 to	3.50

Per gross ton, delivered local foundries:

No. 1 machn. cast†....	$13.50 to	$14.00
No. 2 cast†	10.50 to	11.00

* $1.50 less for truck loads.
† Northern N. J. prices are $2 to $2.50 higher.

BOSTON

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. steel.....		Nominal
Scrap rails		Nominal
No. 2 steel		Nominal
Breakable cast	$10.50 to	$10.60
Machine shop turn....	....	3.38
Mixed bor. & turn.....	2.00 to	2.25
Bun. skeleton long....	....	8.15
Shafting	10.25 to	10.50
Cast bor. chemical....	5.50 to	5.75

Per gross ton delivered consumers' yards:

Textile cast	$13.50 to	$15.00
No. 1 machine cast....	13.50 to	15.00

PACIFIC COAST

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel.	$12.50 to	$14.00
No. 2 hvy. mltng. steel.	11.50 to	13.00

CANADA

Dealers' buying prices at their yards, per gross ton:

	Toronto	Montreal
No. 1 hvy. mltng. steel.	$11.00	$10.00
No. 2 hvy. mltng. steel.	10.00	9.00
Mixed dealers steel....	9.00	8.00
Scrap pipe	5.50	5.00
Steel turnings	4.50	4.00
Cast borings	4.00	3.50
Machinery cast	15.00	14.00
Dealers cast	13.00	12.00
Stove plate	10.00	9.00

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges

No. 1 hvy. mltng. steel.	$12.00 to	$12.25
No. 2 hvy. mltng. steel.	10.50 to	10.75
No. 2 cast	....	11.00
Stove plate	$10.00 to	10.50

Boston on cars at Army Base or Mystic Wharf

No. 1 hvy. mltng. steel.	$13.50 to	$14.00
No. 2 hvy. mltng. steel.	12.50 to	13.00
Rails (scrap)	....	14.00

Philadelphia, delivered alongside boats, Port Richmond

No. 1 hvy. mltng. steel.	$14.50 to	$15.00
No. 2 hvy. mltng. steel.	13.50 to	14.00

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

(Prices are f.o.b. unless otherwise indicated)

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher. F.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open-hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Gross Ton
Pittsburgh, Chicago or Cleveland	$43.00
Worcester, Mass.	45.00
Birmingham	43.00
San Francisco	52.00

Rods over 9/32 in. or 47/64 in., inclusive, $5 a ton over base.

SOFT STEEL BARS

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham	2.25c.
Detroit, delivered	2.35c.
Duluth	2.35c.
Philadelphia delivered	2.57c.
New York	2.59c.
On cars dock Gulf ports	2.60c.
On cars dock Pacific ports	2.85c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.10c.
On cars dock Tex. Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt.	1.90c. to 2.05c.
Detroit, delivered	2.00c. to 2.15c.
On cars dock Tex. Gulf ports	2.25c. to 2.40c.
On cars dock Pacific ports	2.50c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham	1.75c. to 1.90c.
Detroit, delivered	1.85c. to 2.00c.
On cars dock Tex. Gulf ports	2.10c. to 2.25c.
On cars dock Pacific ports	2.35c.

Prices on reinforcing bars have been subject to concessions of $3 a ton or more from above quotations.

IRON BARS

Chicago and Terre Haute	2.15c.
Pittsburgh (refined)	3.60c.

COLD FINISHED BARS AND SHAFTING*

	Base per Lb.
Pittsburgh, Buffalo, Cleveland, Chicago and Gary	2.70c.
Detroit	2.75c.

* In quantities of 10,000 to 19,999 lb.

PLATES

	Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del.	2.10c.
Philadelphia, del'd	2.15c.
New York, del'd	2.29c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.60c.
Wrought iron plates, P't'g	3.80c.

FLOOR PLATES

Pittsburgh or Chicago	3.35c.
New York, del'd	3.71c.
On cars dock Gulf ports	3.70c.
On cars dock Pacific ports	3.95c.

STRUCTURAL SHAPES

	Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham	2.10c.
Philadelphia, del'd	2.215c.
New York, del'd	2.27c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

STEEL SHEET PILING

	Base per Lb.
Pittsburgh, Chicago or Buffalo	2.40c.
On cars dock Gulf ports	2.85c.
On cars dock Pacific ports	2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$40.00
Angle bars, per 100 lb	2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton	$40.00
Light rails (from rail steel) per gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast ports	2.25c.
Track bolts, to steam railroads	4.15c.
Track bolts to jobbers, all sizes (per 100 counts)	65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

SHEETS

Hot Rolled

	Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago	2.15c.
Detroit, delivered	2.25c.
Philadelphia, delivered	2.32c.
Granite City	2.25c.
On cars dock Pacific ports	2.65c.
Wrought iron, Pittsburgh	4.25c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago	3.20c.
Detroit, delivered	3.30c.
Granite City	3.30c.
Philadelphia, delivered	3.52c.
On cars dock Pacific ports	3.80c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham	3.50c.
Philadelphia, delv'd	3.67c.
Granite City	3.60c.
On cars dock Pacific ports	4.00c.
Wrought iron Pittsburgh	6.10c.

Electrical Sheets

(*F.o.b. Pittsburgh*)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Special Motor	4.95c.
Special Dynamo	5.65c.
Transformer	6.15c.
Transformer Special	7.15c.
Transformer Extra Special	7.65c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary	3.95c.
F.o.b. cars dock Pacific ports	4.65c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland	3.35c.
Detroit, delv'd	3.45c.
Granite City	3.45c.
On cars dock Pacific ports	3.95c.

TIN MILL PRODUCTS

***Tin Plate**

	Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary	$5.00
Standard cokes, Granite City	5.10

* Prices effective Nov. 10 on shipments through first quarter of 1939.

Special Coated Manufacturing Ternes

	Per Base Box
Granite City	4.40
Pittsburgh or Gary	$4.30

Roofing Terne Plate

(*F.o.b. Pittsburgh*)

(Per Package, 112 sheets, 20 x 28 in.)	
8-lb. coating I.C.	$12.00
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.00
25-lb. coating I.C.	16.00
30-lb. coating I.C.	17.25
40-lb. coating I.C.	19.50

Black Plate, 29 gage and lighter

Pittsburgh, Chicago and Gary	3.05c.
Granite City	3.15c.
On cars dock Pacific ports, boxed	4.00c.

HOT ROLLED STRIP

(*Widths up to 12 in.*)

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham	2.15c.
Detroit, delivered	2.25c.

Cooperage Stock

Pittsburgh & Chicago	2.25c.

COLD ROLLED STRIP*

	Base per Lb.
Pittsburgh, Youngstown or Cleveland	2.95c.
Chicago	3.05c.
Detroit, delivered	3.05c.
Worcester	3.15c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland	3.10c.
Detroit, delivered	3.20c.
Worcester	3.50c.

COLD ROLLED SPRING STEEL

		Pittsburgh and Cleveland	Worcester
Carbon	0.26-0.50%	2.95c.	3.15c.
Carbon	.51 .75	4.30c.	4.50c.
Carbon	.76-1.00	6.15c.	6.35c.
Carbon	1.01 to 1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.65c.*
Spring wire	3.20c.

* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

To the Trade

	Base per Keg
Standard wire nails	$2.45
Coated nails	2.45
Cut nails, carloads	3.60

	Base per 100 Lb.
Annealed fence wire	$2.95
Galvanized fence wire	3.35
Polished staples	3.15
Galvanized staples	3.40
Twisted barbless wire	3.20
Woven wire fence, base column.	67
Single loop bale ties, base col...	56
Stand. 2 pt., 12.5 gage barbed cattle wire, per 80 rod spool..	$2.54

Note: Birmingham base same on above items, except spring wire.

Add $4 a ton for Mobile, Ala.; $5 for New Orleans; $6 for Lake Charles to above bases, except on galvanized and annealed merchant fence wire, which are $1 a ton additional in ecah case.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel In.	Black	Galv.	*Wrought Iron* In.	Black	Galv.
⅛	56	36	¼ & ⅜	.+ 9	+30
¼ to ⅜	.59	43½	½	24	6½
½	....63½	54	¾	30	13
¾	....66½	58	1 & 1¼	..34	19
1 to 3	..68½	60½	1½	38	21½
			2	....37½	21

Lap Weld

2	61	52½	2	....30½	15
2½ & 3	..64	55½	2½ to 3½	31½	17½
3½ to 6	..66	57½	4	....33½	21
7 & 8	..65	55½	4½ to 8.32½		20
9 & 10	..64½	55	9 to 12	..28½	15
11 & 12	..63½	54			

Butt weld, extra strong, plain ends

⅛	....54½	41½	¼ & ⅜	.+10	+43
½ to ⅜	.56½	45½	½	25	9
½	....61½	53½	¾	31	15
¾	....65½	57½	1 to 2	...38	22½
1 to 3	...67	60			

Lap weld, extra strong, plain ends

2	59	51½	2	....33½	18½
2½ &	63	55½	2½ to	4.39	25½
3½ to 6	..66½	59	4½ to	6.37½	24
7 & 8	..65½	56	7 & 8	..38½	24½
9 & 10	..64½	55	9 to 12	..32	20½
11 & 12	..63½	54			

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall.

(Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
1 in. o.d....13 B.W.G.	$ 9.01	$ 7.82	....
1¼ in. o.d...13 B.W.G.	10.67	9.26	....
1½ in. o.d...13 B.W.G.	11.79	10.23	$9.72
1¾ in. o.d...13 B.W.G.	13.42	11.64	11.06
2 in. o.d.....13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d...13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d...12 B.W.G.	18.45	16.01	15.16
2½ in. o.d...12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d...12 B.W.G.	21.42	18.59	17.54
3 in. o.d.....12 B.W.G.	22.48	19.50	18.35
3½ in. o.d...11 B.W.G.	28.37	24.62	23.15
4 in. o.d.....10 B.W.G.	35.20	30.54	28.66
4½ in. o.d...10 B.W.G.	43.04	37.35	35.22
5 in. o.d..... 9 B.W.G.	54.01	46.87	44.25
6 in. o.d..... 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. or over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

	Pet Net Ton
*6-in. and larger, del'd Chicago.	$51.00
6-in. and larger, del'd New York	49.00
*6-in. and larger, Birmingham.	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles....	52.00
F.o.b. dock, Seattle	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, $3 extra 4-in. pipe is $3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $42, Birmingham, and $50 delivered Chicago and 4-in. pipe, $45, Birmingham, and $54 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
½ in. & 6 in. and smaller.	65, 5 and 5*
Larger and longer up to 1 in.	60, 10 and 5*
1⅛ in. and larger	60, 5 and 5*
Lag bolts	60, 10 and 5
Plow bolts, Nos. 1, 2, 3 and 7	65, 5 and 5
Hot pressed nuts, and c.p.c. and t nuts, square or hex. blank or tapped:	
½ in. and smaller	65 and 5
9/16 in. to 1 in. inclusive.	60, 5 and 5
1⅛ in. and larger	60 and 5

* Less carload lots and less than full container quantity. Less carload lots in full container quantity, an additional 10 per cent discount; carload lots and full container quantity, still another 5 per cent discount.

	U.S.S.	S.A.E.
Semi-fin. hexagon nuts ½ in. and smaller	65-5	70
9/16 to 1 in.	60-10	65
1⅛ in. and larger	60-5	60-5

In full container lots, 10 per cent additional discount.

Stove bolts in packages, nuts attached	75
Stove bolts in packages, with nuts separate	75 and 12½
Stove bolts in bulk	85

On stove bolts freight is allowed to destination on 200 lb. and over.

Large Rivets

(½-in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland Chicago, Birmingham $3.40

Small Rivets

(7/16-in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham .... 65 and 10

Cap and Set Screws

(Freight allowed to destination)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled square head set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread ¾ in. and smaller	68 and 10
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	65 and 10
Upset set screws, cup and oval points	73 and 10
Milled studs	57 and 10

Alloy and Stainless Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.

Base price, $56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base	2.80c.
Delivered, Detroit	2.90c.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
200 (½% Nickel)	$0.35
2100 (1½% Nickel)	$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
3100 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)	0.75
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)	1.10
5100 Chrome steel (0.60-0.90 Cr.)	0.35
5100 Chrome steel (0.80-1.10 Cr.)	0.45
5100 Chromium spring steel	0.15
6100 Chromium-vanadium bar	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.40c. base per lb. Delivered Detroit, 3.50c., carlots.

CORROSION & HEAT RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	29c.	27c.
Structural shapes.	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip	23.50c.	21.50c.
Cold-rolled strip	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c.	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot strip	17c.	17.50c.	23c.	28c.
Cold stp.	22c.	22.50c.	28.50c.	36.50c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Ferromanganese, export	Nominal
Tin plate, per base box	20s. 3d. to 21s. 6d.
Steel bars, open hearth.	£11
Beams, open-hearth	£10 12s. 6d.
Channels, open-hearth	£10 17s. 6d.
Angles, open-hearth	£10 12s. 6d.
Black sheets, No. 24 gage.	£13
Galvanized sheets, No. 24 gage	£15 5s.

CONTINENTAL

Per Gross Ton, Gold £.
f.o.b. Continental Ports

Billets, Thomas	Nominal
Wire rods, No. 5 B.W.G.	£5 10s.
Steel bars, merchant	£5 5s.
Sheet bars	Nominal
Plate ¼ in. and up	£5 7s.
Plate 3/16 in. and 5 mm.	£5 13s.
Sheets ⅛ in.	£5 9s. 6d.
Beams, Thomas	£4 18s.
Angles (Basic)	£4 18s.
Hoops and strip, base	£5 12s.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	$22.75
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	$22.00
Delivered Brooklyn	24.50
Delivered Newark or Jersey City	23.53
Delivered Philadelphia	22.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	21.00
F.o.b. Buffalo	21.00
F.o.b. Detroit	21.00
Southern, delivered Cincinnati	21.06
Northern, delivered, Cincinnati	21.44
F.o.b. Duluth	21.50
F.o.b. Provo, Utah	19.00
Delivered, San Francisco, Los Angeles or Seattle	24.50
F.o.b. Birmingham*	17.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	$22.25
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	21.50
F.o.b. Buffalo	20.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	20.50
Delivered Philadelphia	22.34
Delivered Canton, Ohio	21.89
Delivered Mansfield, Ohio	22.44
F.o.b. Birmingham	16.00

Bessemer

F.o.b. Buffalo	$22.00
F.o.b. Everett, Mass.	23.75
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	23.00
Delivered Newark or Jersey City	24.53
Erie, Pa., and Duluth	22.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	21.50
F.o.b. Birmingham	22.00
Delivered Cincinnati	22.11
Delivered Canton, Ohio	22.89
Delivered Mansfield, Ohio	23.44

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.	$26.50

Gray Forge

Valley or Pittsburgh furnace	$20.50

Charcoal

Lake Superior furnace	$25.00
Delivered Chicago	28.34

Canadian Pig Iron

Per Gross Ton

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$26.50
No. 2 fdy., sil. 1.75 to 2.25	25.50
Malleable	26.00
Basic	25.50

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$27.50
No. 2 fdy., sil. 1.75 to 2.25	27.00
Malleable	27.50
Basic	27.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload)	$92.50

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$28.00
Domestic, 26 to 28%	33.00

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	$69.50*
50% (ton lots in 50 gal. bbl.)	80.50*
75% (carload lots, bulk)	126.00*
75% (ton lots in 50 gal. bbl.)	139.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50%	$30.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, $1 per ton additional. Phosphorus 0.75% or over, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50%	$24.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	10.50c.*
2% carbon	16.50c.*
1% carbon	17.50c.*
0.10% carbon	19.50c.*
0.06% carbon	20.00c.*

Silico-manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	$92.75
2.50% carbon	97.75
2% carbon	102.75
1% carbon	112.75

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads, nominally	$2.00
Ferrotungsten, lots of 500 lbs. nominally	2.05
Ferrotungsten, smaller lots, nominally	2.10
Ferrovanadium, contract, per lb. contained V., delivered	$2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., tons lots.	$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	$157.50
Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic, 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville	$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.

*Spot prices are $5 per ton higher
†Spot prices are 10c. per lb. of contained element higher.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, Bessemer, 51.50%	$5.25
Old range, non-Bessemer, 51.50%	5.10
Messabi, Bessemer, 51.50%	5.10
Messabi, non-Bessemer, 51.50%	4.95
High phosphorus, 51.50%	4.85

Foreign Ore

C.i.f. Philadelphia or Baltimore

Per Unit

Iron, low phos., copper free, 55 to 58% dry, Algeria	12c.
Iron, low phos., Swedish, average, 68½% iron	12½c.
Iron, basic or foundry, Swedish, aver. 65% iron	11c.
Iron, basic or foundry, Russian, aver. 65% iron	Nominal
Man., Caucasian, washed 52%	31c.
Man., African, Indian, 44-48%	29c.
Man., African, Indian, 49-51%	31c.
Man., Brazilian, 46 to 48½%	28c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$19.50
Tungsten, domestic, scheelite delivered	$18.00 to $19.00
Chrome ore (lump) c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	$15.00
Rhodesian, 45%	19.00
Rhodesian, 48%	23.00
Turkish, 48-49%	23.00
Turkish, 45-46%	19.00
Turkish, 40-44%	16.00
Chrome concentrates (Turkish) c.i.f. Atlantic Seaboard, per gross ton: 50%	$24.00
48-49%	22.50

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$17.00 to $18.00
Domestic, f.o.b. Ohio River landing barges	18.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	18.00
Foreign, 85% calcium, fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	24.50
Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	31.50

FUEL OIL

Per Gal

No. 2 or diesel, f.o.b. Bayonne	4.125c.
No. 6, f.o.b. Bayonne	2.26c.
Del'd Chicago, No. 5 Bur. Stds.	3.25c.
Del'd Chicago, No. 6 Bur. Stds.	2.75c.
Del'd Cleve'd, No. 3 distillate	5.50c.
Del'd Cleve'd, No. 4 industrial	5.25c.
Del'd Cleve'd, No. 5 industrial	3.00c.
Del'd Cleve'd, No. 6 industrial	2.75c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, Prompt	$3.75
Foundry, f.o.b. Connellsville, Prompt	$4.75 to 5.50
Foundry, by-product, Chicago ovens	10.25
Foundry, by-product, del'd New England	12.50
Foundry, by-product, del'd Newark or Jersey City	10.88 to 11.40
Foundry, by-product, Philadelphia	10.95
Foundry, by-product, delivered Cleveland	10.30
Foundry, by-product, delivered Cincinnati	9.75
Foundry, Birmingham	7.50
Foundry, by-product, del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

IRON AND STEEL WAREHOUSE PRICES

PITTSBURGH

	Base per Lb.
Plates	3.55c.
Shapes	3.55c.
Soft steel bars and small shapes	3.60c.
**Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.95c.
Hot rolled strip	3.75c.
Hot rolled sheets	3.50c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.50c.
Wire, black, soft annealed	3.15c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.75c.
Wire nails (in 100-lb. kegs)	2.65c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb.

** On reinforcing bars base applies to orders of less than one ton and includes switching and carting charge.

All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
Plates, ¼ in. and heavier	3.83c.
Structural shapes	3.75c.
Soft steel bars, round	3.94c.
Iron bars, Swed. charcoal	7.50 to 8.25c.
Cold-fin. shafting and screw stock:	
Rounds, squares, hexagons	4.39c.
Flats up to 12 in. wide	4.39c.
Cold-rolled strip, soft and quarter hard	3.66c.
Hot-rolled strip, soft O.H.	4.11c.
Hot-rolled sheets (10 ga.)	3.73c.
Galv. sheets (24 ga.)	4.60 to 4.85c.
Long ternes (24 ga.)	5.50 to 6.20c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.90c.
Deep drawing	5.15c.
Stretcher leveled	5.50c.
SAE, 2300, hot-rolled	7.50c.
SAE, 3100, hot-rolled	6.10c.
SAE, 6100, hot-rolled annealed	10.25c.
SAE, 2300, cold-rolled	8.69c.
SAE, 3100, cold-rolled, annealed	7.29c.
Floor plate, ⅛ in. and heavier	5.43c.
Standard tool steel	12.50c.
Wire, black, annealed (No. 9)	4.65c.
Wire, galv. (No. 9)	5.00c.
Open-hearth spring steel	4.75c. to 10.25c.
Common wire nails, per keg in 25 keg lots	$3.25

CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.60c.
Soft steel squares, hexagons, channels and Tees	3.75c.
Hot rolled strip	3.75c.
Floor plates	5.15c.
Hot rolled sheets	3.50c.
Galvanized sheets	4.50c.
Cold rolled sheets	4.45c.
Cold finished carbon bars	4.05c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.55c.
Structural shapes	3.73c.
Soft steel bars	3.50c.
Reinfor. bars (under 2000 lb.)†	2.55c.
Cold-fin. bars (1000 lb., over)	4.05c.
Hot-rolled strip	3.65c.
Cold rolled sheets	4.70c.
Cold-finished strip	3.35c.
Galvanized sheets (No. 24)	4.62c.
Hot-rolled sheets	3.50c.
Floor plates, 3/16 in. and heavier	5.33c.
*Black ann'l'd wire, per 100 lb.	$3.10
*No. 9 galv. wire, per 100 lb.	3.50
*Com. wire nails, base per keg	2.60
Hot rolled alloy steel (3100)	6.05c.
Cold rolled alloy steel (3115)	6.85c.

* For 5000 lb. or less
† 500 lb., base quantity.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lb. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 399 lb. and under.

ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.82c.
Bars, soft steel (rounds and flats)	3.87c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	4.02c.
Cold fin. rounds, shafting, screw stock	4.32c.
Galv. sheets (24 ga.)	4.77c.
Hot rolled sheets	3.77c.
Galv. corrugated sheets, 24 ga. and heavier*	4.82c.
Structural rivets	5.02c.

* No. 26 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	5.85c.
Plates, ¼ in. and heavier	3.85c.
Bars	3.98c.
Heavy hot rolled sheets	3.86c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.76c.
Galvanized sheets	4.76c.
Cold rolled sheets	4.93c.

The following quantity differentials apply: Less than 100 lb., plus $1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.

BUFFALO

Plates	3.77c.
Floor plates	5.40c.
Struc. shapes	3.55c.
Soft steel bars	3.60c.
Reinforcing bars (20,000 lb. or more)	2.05c.
Cold-fin. flats, squares, rounds, and hex.	4.05c.
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl. also sizes No. 8 to 30 ga.	3.50c.
Galv. sheets (24 ga.)	4.50c.
Bands and hoops	3.97c.

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Boiler rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1, Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$47.50
Chicago District	56.05
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55

Chrome Brick

	Per Net Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$47.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	47.00

Magnesite Brick

	Per Net Ton
Standard f.o.b. Baltimore and Chester	$67.00
Chemically bonded, f.o.b. Baltimore	57.00

Grain Magnesite

	Per Net Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	$45.00
Domestic, f.o.b. Baltimore and Chester, in sacks	40.00
Domestic, f.o.b. Chewelah Wash. (in bulk)	22.00

PHILADELPHIA

	Base per Lb.
*Plates, ¼-in. and heavier	3.40c.
*Structural shapes	3.40c.
*Soft steel bars, small shapes, iron bars (except bands)	3.60c.
‡Reinforc. steel bars, square and deformed	2.61c.
Cold-finished steel bars	4.36c.
*Steel hoops	4.10c.
*Steel bands, No. 12 and 3/16 in. incl.	3.60c.
*Spring steel	4.75c.
†Hot-rolled anneal. sheets	3.40c.
†Galvanized sheets (No. 24)	4.50c.
*Diam. pat. floor plates, ¼ in.	5.00c.

These prices are for delivery in Philadelphia trucking area.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 25 bundles or over.

‡For one to five tons.

BIRMINGHAM

Bars and bar shapes	$3.85 base	
Structural shapes and plates	3.75 "	
Hot rolled sheets No. 10 ga.	3.80 "	
Hot rolled sheets No. 24 ga.	4.40 "	3500 lb. and over
Galvanized sheets No. 24 ga.	5.05 "	3500 lb. or more
Strip	4.05 "	
Reinforcing bars.	3.85 "	
Floor plates	5.96 "	
Cold finished bars	4.91 "	
Machine and carriage bolts	.50 & 10 off list	
Rivets (structural)	$4.60 base	

On plates, shapes, bars, hot-rolled strip heavy hot-rolled sheets, the base applies on 400 to 3999 lb. All prices are f.o.b. consumer's plant.

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	4.00c.	4.00c.	4.05c.
Shapes, standard	4.00c.	4.00c.	4.05c.
Soft steel bars	4.05c.	4.00c.	4.30c.
Reinforcing bars, f.o.b. cars dock	Pacific ports	2.675c.	open. 2.975c.
Hot-rolled sheets (No. 10)	4.00c.	4.20c.	3.95c.
Galv. sheets (No. 24 and lighter)	5.15c.	5.05c.	5.25c.
Galv. sheets (No. 22 and heavier)	5.40c.	5.05c.	5.25c.
Cold-finished steel Rounds	6.55c.	6.60c.	7.10c.
Squares and hexagons	7.80c.	7.85c.	7.10c.
Flats	8.30c.	8.35c.	8.10c.
Common wire nails—base per keg less carload	$3.20	$3.05	$3.00

All items subject to differentials for quantity.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

MEMPHIS

	Base per Lb.
Mild steel bars	4.01c.
Shapes, bar size	4.01c.
Iron bars	4.01c.
Structural shapes	3.96c.
Plates	3.96c.
Hot-rolled sheets	3.91c.
Galvanized sheets, No. 24	5.26c.
Steel bands	4.16c.
Cold-drawn rounds	4.61c.
Cold-drawn flats, squares, hexagons	6.61c.

PLANT EXPANSION AND EQUIPMENT BUYING

NORTH ATLANTIC

Remington-Rand, Inc., 315 Fourth Avenue, New York, typewriters, accounting machines, etc., plans expansion in plant No. 1, at Ilion, N. Y., and is arranging with Remington Arms Co., for lease of about 25,000 sq. ft. of floor space in building on Main Street. Company plans early removal of part of typewriter rebuilding department from works at Middletown, Conn., to Ilion, where capacity will be increased.

Crown Metal Mfg. Corp., New York, organized to manufacture metal products, has leased space in building at 67 Irving Place for plant.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bid until Jan. 9 for about 250,000 ft. of cable and necessary reels (Circular 106); until Jan. 13, two power units (Circular 124); until Jan. 17 jack plates, plug plates and switchboxes (Circular 128).

American Viscose Corp., 200 Madison Avenue, New York, is placing orders for primary equipment for installation in new mill at Front Royal, Va., now in course of construction, with commitments to date approximating $500,000; other awards for operating equipment will be made soon. Plant will consist of several large units, with power house, pumping station, machine shop, etc., and will represent a total investment of about $2,000,000. Wark Co., 1608 Walnut Street, Philadelphia, is contractor.

Commanding Officer, Watervliet Arsenal, Watervliet, N. Y., asks bids until Jan. 6 for snap and thread gages (Circular 106), special gages (Circular 109).

American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York, plans construction of new plant for processing bauxite ore at Little Rock, Ark., comprising a main one-story mill, and smaller buildings for storage, distribution, etc. Plant will be operated by Porocel Corp., a subsidiary. Cost reported over $100,000 with equipment.

Aerovox Corp., 70 Washington Street, Brooklyn, manufacturer of condensers and kindred equipment, is removing plant to New Bedford, Mass., where company has purchased one- and three-story buildings totaling 433,000 sq. ft. of floor space, or approximately four times area of Brooklyn works. Production will be concentrated at new location, with operations scheduled to begin next February.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for one motor-driven universal punch and shear (Schedule 5143), one 35-kva. electric stud welder (Schedule 5144), 155 arc welding control panels (Schedule 5195), pressure reducing valves and spare parts (Schedule 5131), motor-driven, vertical, hollow chisel mortiser power feed (Schedule 5151), for Brooklyn Navy Yard; 12 worm gear reduction units (Schedule 5238); until Jan. 10, plug cocks (Schedule 5239), for Brooklyn and Philadelphia yards; relief valves (Schedule 5260) for Brooklyn yard.

Rifkin Brothers, 54 Bleecker Street, New York, manufacturers of silver hollow-ware and kindred metal goods, has leased a floor in building at 2 Garden Street, Newark, N. J., for plant.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until Jan. 3 for rubber-insulated wire and stranded wire (Circular 469).

Erno Products Co., 17 North Second Street, Philadelphia, manufacturer of malt products, has leased a four-story and basement building at 65 North Second Street for expansion.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for three motor-driven engine lathes (Schedule 5180), 200 pneumatic drills, complete with drill extensions or angle attachments (Schedule 5182) for Philadelphia Navy Yard.

Department of Property and Supplies, Capitol Building, Harrisburg, Pa., has asked bids on general contract for one-story highway equipment maintenance, repair, storage and distributing building at Warren, Pa. Cost about $160,000. Architectural department, address noted, in charge.

Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia, asks bids until Jan. 3 for one eight-spindle automatic chucking machine (Circular 584), 12-in. vertical shaper (Circular 582), motor-driven, multiple spindle combination drilling and milling machine, automatic indexing, dial feed (Circular 580), hydraulic banding press for 5-in shell (Circular 588), horizontal automatic, motor-driven (Circular 587); until Jan. 9, hollow-chisel mortiser and 24-in. woodworking lathe (Circular 591).

BUFFALO DISTRICT

Central New York Power Corp., Ithaca, N. Y., a unit of Niagara-Hudson Power Corp., Electric Building, Buffalo, has let general contract to Stone & Webster Engineering Corp., Boston, for new steam-electric generating station at Oswego, N. Y., with initial capacity of 80,000 kw. A traveling crane will be installed. Completion is scheduled early in 1940. Cost about $9,500,000.

Hope's Windows, Inc., Hopkins Avenue, Jamestown, N. Y., manufacturer of metal window casements, has let general contract to Haas Construction Co., 1001 Monroe Street, for one-story addition to plant at East Jamestown, 100 x 400 ft. Cost about $100,000 with equipment. Beck & Tinkham, Bailey Building, are architects.

NEW ENGLAND

Autoyre Mfg. Co., Oakville, Conn., manufacturer of wire goods, metal stampings, etc., plans one-story addition, 60 x 200 ft., for storage and distribution, with air-conditioning system. Traveling cranes and other mechanical-handling facilities will be installed. New boiler house, 40 x 60 ft., also will be built. Cost over $75,000 with equipment. Fletcher-Thompson, Inc., 1336 Fairfield Avenue, Bridgeport, Conn., is architect and engineer.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for six upright drill presses, with additional tools and equipment (Schedule 5177), one hydraulic open-side planer (Schedule 5179), shearing and squaring machine (Schedule 5193), all motor-driven; one automatic oxy-acetylene shape cutting machine (Schedule 5210) for Boston Navy Yard; until Jan. 10, three projectile-loading hydraulic presses (Schedule 5149) for Hingham, Mass., Fort Mifflin, Pa., and Puget Sound, Wash.; one motor-driven internal grinder (Schedule 5244) for Newport, R. I., naval station.

Risdon Mfg. Co., Naugatuck, Conn., manufacturer of stamped metal products, wire goods, etc., has let general contract to W. J. Megin, Inc., 51 Elm Street, for one-story addition, 40 x 130 ft. Cost over $40,000 with equipment. Leo F. Caproni, 1221 Chapel Street, New Haven, Conn., is architect and engineer.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until Jan. 6 for one 12-in. motor-driven shaper, crank or hydraulic, universal type (Circular 207), one horizontal counter-sinking machine, semi-automatic, opposed spindle (Circular 202).

SOUTH ATLANTIC

Duke Power Co., Charlotte, N. C., has acquired property at Cliffside for new steam-electric generating plant, work to begin early in 1939. Extensions will be made in transmission lines for connection with present system. Cost about $1,00,000. Charles I. Burkholder is vice-president and chief engineer.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Jan. 4 for boiler units, mechanical stokers, forced draft fans and auxiliary equipment for installation in power house at Charleston, S. C., Navy Yard (Specifications 8820).

Swift & Co., Union Stock Yards, Chicago, have approved plans for new branch plant for storage and distribution at Columbia, S. C. Cost about $50,000 with equipment.

WASHINGTON DIST.

United States Engineer Office, Navy Building, Washington, asks bids until Jan. 4 for one 6 x 6 in. metal-sawing machine (Circular 41), one pipe and bolt-threader (Circular 43).

Bureau of Yards and Docks, Navy Department, Washington, has let general contract to Rust Engineering Co., Clark Building, Pittsburgh, for one-story addition to foundry at Norfolk Navy Yard, Portsmouth, Va., at $292,500, exclusive of equipment.

General Purchasing Officer, Panama Canal, Washington, asks bids until Jan. 3 for 70,000 ft. of copper wire, 50 electric drills, 20,000 steel track spikes, cartridge type resistors, copper ground rods, and other equipment (Schedule 3407); until Jan. 5, two elevating or lift-type electric industrial trucks, 1000 lb. steel packing case strapping, brass machine screws, brass wood and steel cap screws, machine screw nuts, screw anchor shackles, liquid sprayers and other equipment (Schedule 3409).

Louisa County Board of Education, Louisa, Md., has asked bids on general contract for manual training shop in connection with two-story central high school. Cost over $45,000.

Board of District Commissioners, District Building, Washington, asks bids until Jan. 6 for brake and headlight testing machine, wheel alignment and indicating machines, and inspection air lifts for traffic department; also for electric-operated mixing machines for public schools.

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until Jan. 11 for 38 motor and blower units, mounted on cast iron base (Circular 185).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for one milling machine and one set of attachments (Schedule 5185) for Bellevue, D. C.; one drill press, with additional tools and equipment (Schedule 5178), one automatic profiler, with additional tools and equipment (Schedule 5189), one combination hydraulic drilling and tapping machine (Schedule 5188) for Alexandria, Va., yard; until Jan. 10, two keyway cutters (Schedules 5212 and 5213), all motor driven; one 1000-ton hydraulic forming press (Schedule 5215) for Norfolk, Va., Navy Yard.

SOUTHWEST

Bethlehem Supply Co., National Bank of Tulsa Building, Tulsa, Okla., subsidiary of Bethlehem Steel Co., plans expansion and improvements in recently acquired local plants of International Supply Co., and Oklahoma Iron Works, Inc., East Archer Street, manufacturer of oil well equipment. Properties will be remodeled and consolidated and additional equipment installed. Cost over $150,000 with equipment. Guy A. Thompson is vice-president and general manager.

Board of Education, Hays, Kan., has let general contract to Peterson Construction Co., Salina, Kan., for new two-story and basement shop unit at local high school, 66 x 100 ft. Cost about $185,000 with tools and equipment. Joseph W. Radotinsky, Commercial National Bank Building, Kansas City, Kan., is architect.

Albuquerque Gas & Electric Co., Albuquerque, N. M., plans expansion and improvements in steam-electric generating plant at Bernalillo, N. M., including new 2500-kva. steam turbo-generator unit, condenser and auxiliary equipment. Cost close to $175,000.

Hill County Cotton Oil Co., Hillsboro, Tex., manufacturer of cottonseed oil products, plans rebuilding part of mill recently destroyed by fire. Loss close to $100,000 with equipment.

Coca-Cola Bottling Co., Houston Tex., has let general contract to E. Lee Bond, 805 Blodgett Street, for one-story mechanical-bottling plant at Live Oak and Rusk Streets.

Cost over $50,000 with equipment. Maurice J. Sullivan, 912 Truxillo Street, is architect.

Addicks Independent School District, Addicks, Tex., plans one-story manual training shop at new local high and grade school, for which bids are being asked on general contract. Cost over $100,000. Hedrick & Lindsey, Inc., Sterling Building, Houston, Tex., is architect.

SOUTH CENTRAL

Shawhan Distillery Co., Inc., care of T. J. Pendergast, 1908 Main Street, Kansas City, Mo., head of T. J. Pendergast Wholesale Liquor Co., Kansas City, recently organized with capital of $250,000 by Mr. Pendergast and associates, plans new distillery near Bardstown, Ky., where property is being secured. Cost over $85,000 with equipment.

State Board of Education, State Capitol, Baton Rouge, La., has let general contract to J. A. Harper, Crowville, La., for one-story addition to Louisiana Negro normal and industrial school, Grambling, La., at $129,907 exclusive of equipment.

Mississippi River Commission, Vicksburg, Miss., asks bids until Jan. 3 for one completely equipped soil-drilling unit, mounted on motor truck (Circular 14).

Memphis Light and Water Board, Memphis, Tenn., asks bids until Jan. 5 for overhead electrical distribution lines in different parts of city (Contract No. 27-A). Estimated cost $310,200.

Vermillion Parish School Board, Abbeville, La., has let general contract to Caldwell Brothers & Hart, 815 Howard Avenue, New Orleans, for one-story industrial school unit at $67,913, exclusive of equipment. William R. Burk, Balter Building, New Orleans, is architect.

WESTERN PA. DIST.

Pennsylvania Railroad Co., Pittsburgh, plans rebuilding engine house and machine shops at locomotive repair works, Oil City, Pa., recently destroyed by fire. Loss about $100,000 with equipment.

Department of Public Works, City-County Building, Pittsburgh, plans call for bids early in 1939 for new municipal garbage and refuse incinerator plant on Twenty-ninth Street, with furnaces and other equipment. Cost close to $1,000,000 with equipment.

Ward Foundry Co., Blossburg, Pa., manufacturer of machinery castings, etc., plans rebuilding part of foundry recently destroyed by fire. Loss over $100,000 with equipment.

OHIO AND INDIANA

Spun Steel Corp., 2037 Dueber Street, S.W., Canton, Ohio, manufacturer of steel products, has let general contract to Schmader Brothers Co., 613 Bedford Avenue, S.W., for one-story addition. Cost close to $45,000 with equipment.

Genuine Auto Parts Co., 360 South Main Street, Dayton, Ohio, has let general contract to Henry Stook & Son, 26½ North Ludlow Street, for one-story building for storage and distribution. Cost close to $40,000 with equipment.

Quartermaster, Air Corps, Wright Field, Dayton, Ohio, has secured an appropriation of $3,000,000 for expansion in local air field, to include construction of a laboratory unit for experimental and development work on army aircraft, and other field shop structures.

Ottawa Hills School District, Ottawa Hills, Ohio, plans installation of a manual training department in new two-story central high school, for which bids have been asked on general contract. Cost about $350,000. Financing has been arranged through Federal aid. Mills, Rhines, Bellman & Nordhoff, Inc., 518 Jefferson Avenue, Toledo, Ohio, is architect.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Jan. 3 for impeller assemblies (Circular 421), burring reamers, head reamers and taper reamers (Circular 476); until Jan. 4, two 3000-lb. crane-type electric trucks, six two-ton electric platform trucks, one three-ton and one two-ton electric trucks (Circular 489), V-engine transportation cradle assemblies, 15 radial engine transportation cradle assemblies, and 30 radial engine transportation cradle mounts (Circular 487), pump assemblies (Circular 430); until Jan. 5, one 220-ton motor-driven sheet metal-forming press, one 75-ton and one 35-ton hand-operated, hydraulic arbor press (Circular 494); until Jan. 13, vacuum pump assemblies (Circular 488).

Commercial Solvents Corp., 1331 South First Street, Terre Haute, Ind., industrial chemical products, solvents, etc., plans one-story addition for storage and distribution. Cost over $65,000 with equipment. Main offices of company are 230 Park Avenue, New York.

MICHIGAN DISTRICT

Art Engineering & Machine Corp., Dayton, Ohio, manufacturer of mechanical equipment, parts, etc., has taken over a building at 1489 East Fort Street, Detroit, for plant. Removal is under way from Dayton. Capacity will be increased at new location.

State Department of Public Buildings, Capitol Building, Lansing, Mich., H. D. Smith, state budget director, has asked bids on general contract for new power house at institution at Coldwater, Mich. Cost about $100,000 with equipment. Stewart-Kingscott Co., 208 Elm Street, Kalamazoo, Mich., is architect and engineer.

Hinde & Dauch Paper Co., Decatur Street, Sandusky, Ohio, manufacturer of corrugated fiber boxes and containers, has let general contract to Otto Randolph, Inc., 53 West Jackson Boulevard, Chicago, for one-story branch plant on 11-acre tract at West Chicago Avenue and Pennsylvania Railroad, Detroit. Main unit will be one-story, 200 x 510 ft., with several smaller structures for storage, distribution and other service. Cost about $450,000 with mechanical-handling and other equipment.

MIDDLE WEST

R. R. Donnelley & Sons Co., 350 East Cermak Road, Chicago, will take bids early in January for two-story and basement addition to printing plant, 325 x 375 ft., installation to include heavy-duty machinery, mechanical-handling and other equipment. Cost about $400,000 with machinery. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

Constructing Quartermaster, Chanute Field, Rantoul, Ill., asks bids until Jan. 18 for construction of two acetylene gas-generating stations, Nos. 1 and 2.

City Council, Minneapolis, will take bids early in January on general contract for one-story addition to municipal equipment and mechanical shop at 1308 Currie Avenue, including improvements in power house. Cost close to $183,000 with equipment. Financing has been arranged through Federal aid. A. M. Larson and Fred T. Paul, City Hall, are city architect and city engineer respectively.

Board of Trustees, Municipal Power Plant, Harlan, Iowa, asks bids until Jan. 7 for extensions and improvements in station, including new diesel engine-generator unit, exciter and auxiliary equipment.

Purchasing and Contracting Officer, Quartermaster Corps, CCC, Omaha, Neb., asks bids until Jan. 4 for clamps, chisels, saws, scrapers, bevels, countersink bits, screws, drills, soldering irons, vises and other tools (Circular 5701-53).

Prichard Oil Co., Bettendorf, Iowa, has authorized new bulk oil storage and distributing plant with initial steel tank capacity of 150,000 gal., pumping station and other units. Cost close to $40,000 with equipment.

United States Engineer Office, City National Bank Building, Omaha, Neb., asks bids until Jan. 5 for 33,000 galvanized wire rope clips (Circular 222).

Dubuque Packing Co., Sixteenth and Sycamore Streets, Dubuque, Iowa, meat packer, plans six-story and basement addition to main packing plant, work to be carried out early in 1939. Cost close to $100,000 with equipment.

PACIFIC COAST

Worley & Co., 260 North Durfee Avenue, Pico, Los Angeles, manufacturers of steel lockers, shelving and other sheet steel products, have asked bids on general contract for one-story addition, 60 x 160 ft. Cost close to $50,000 with equipment. Gable & Wyant, 3723 Wilshire Boulevard, are architects.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Jan. 25 for large one-story building at Mare Island Navy Yard, for equipment storage and distribution (Specifications 8742).

Vega Airplane Co., 1627 Victory Place, Burbank, Cal., a subsidiary of Lockheed Aircraft Corp., has arranged for purchase of adjoining property formerly held by Empire China Co., consisting of about 6½ acres, with one-story buildings totaling 77,000 sq. ft. of floor space. Structure will be remodeled for expansion.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 10 for one steel solid propeller shaft (Schedule 5148) three floor-type, dry, double grinders (Schedule 5161), one knife grinder (Schedule 5160), two high-pressure hydraulic test pumps (Schedule 5194); until Jan. 13, two gasoline engine-driven industrial tractors, and 20 four-ton all-steel trailers, fifth-wheel type (Schedule 5231), one punch and shear (Schedule 5211) for Mare Island Navy Yard; until Jan. 10, two bench-type drill presses (Schedule 5139), one milling machine (Schedule 5140), one precision bench lathe (Schedule 5141), all machines to be motor driven; until Jan. 13, parts for airplanes (Schedule 900-2250) for San Diego Naval Air Station.

J. D. Ross, Department of Interior, Portland, administrator, Bonneville, Ore., power project, asks bids until Jan. 10 for machine bolts, eye bolts, locknuts, square washers, shackles, corner construction brackets and other equipment for Vancouver, Wash.-Eugene, Ore., high-tension line of Bonneville transmission system (Circular 107); until Jan. 12 for 1,202,000 ft. of copper conductor, 240 connectors, 500 dead-ends, and two complete sets of special portable equipment for installing connectors and dead-ends (Circular 109).

FOREIGN

Rolls-Royce, Ltd., Osmaston, Derby, England, automobiles and parts, has work under way on new plant at Crewe, Cheshire, for production of airplane engines. It will comprise several one-story units for parts production and assembling, with facilities for employment of about 4000 men. Cost over $1,000,000 with machinery.

H. F. H. Spry Pty., Ltd., Melbourne, Victoria, Australia, manufacturer of cereals, has acquired group of buildings with adjoining land at Heidelberg Road and Edwards Street, Fairfield district, and will remodel for new plant. A one-story addition will be erected. Cost about $100,000 with equipment.

Canadian Car & Foundry Co., Ltd., Montreal, has acquired former plant of Thomas Davidson Mfg., Ltd., Lachine, and will improve for early occupancy by aircraft division, with facilities for production of Government planes of bomber and other types, including parts manufacture and assembling.

Navy Announces Steel Work Bids

WASHINGTON.—Low bids announced by the Navy Department for steel work follow: American Bridge Co., Baltimore, structural steel work at Mare Island, Cal., navy yard machine shops, $508,356; Bethlehem Steel Co., structural steel framework at Alameda, Cal., navy station, $212,300; Winslow Marine & Shipbuilding Co., Seattle, Wash., construction of caisson gate at Puget Sound, Wash., dry dock, $389,650.

THIS WEEK'S MACHINE ...TOOL ACTIVITIES...

. . . Pick-up in domestic ordering seen as a year closes in which foreign orders predominated . . . Navy purchases lead in the East.

Cincinnati Builders Report Domestic Order Gain

CINCINNATI—The closing weeks of a spotty year brought a more consistent machinery demand than the preceding month. Small gains in domestic ordering turned hopes of manufacturers to optimistic predictions for the new year. While during the greater part of 1938, foreign business was the "bread and butter" of tool demand, American purchasing began to close the gap during the past quarter with better gains noted the past week. One interest indicated a present two-to-one balance favoring foreign business, while another reports a domestic balance of almost the same ratio. Armament tools are most prominent in export business and undisclosed sources have placed several multiple unit orders for millers and grinders. Lathe demand tends more domestic, with single tool requisitions reported. Heavy machinery continues in fair volume.

Production is being maintained at a market level of better than 50 per cent. Some plants are filling in with machines for stock, while others are still on backlogs.

1938 Machine Tool Volume Half of That of 1937

CLEVELAND—With the year practically ended, total 1938 machine tool volume for producers, on the nationwide scale, is only approximately one-half of the volume received in 1937. Nevertheless, machine tool manufacturers as a whole have operated above the average this year in comparison to other major industries.

Foreign business held up well, being roughly about equal to the 1937 volume. Domestic sales, however, fell off to only about one-third of the 1937 total. The upturn experienced in the latter classification during recent months was a little stronger than anticipated, but insufficient to overcome slack months earlier in the year.

Expectations are that 1939 will prove much better on the domestic side. Some producers in this vicinity anticipate a swift rise starting in February or March and continuing for approximately three months.

International Harvester Focus Of Chicago Dealer Bids

CHICAGO—Machine tool sales offices here are chiefly occupied with quoting on various proposals of the International Harvester Co. Little of a general nature is being received, but all are hoping for increased industrial expenditures next year for machinery and machine tools.

Precision Gage Blocks Selling Well

DETROIT—While, for the most part, there has been a distinct seasonal letdown in this area, encouragement can be derived from an increase in the last month in the precision gaging business. In the last seven working days of November the Johansson Gage Division of the Ford Motor Co. shipped 50 orders of precision blocks, for instance. It is reported that in this line of business many new customers are active, and firms that have not been heard from for five or six years are seeking replacements and adding to equipment. The present season finds replacement business the only factor in machine tool buying, although Chrysler Corp. has on order a $45,000 machine for the Superfinishing of cylinder bores.

Navy Buying Features Eastern Market

NEW YORK—Several of the Eastern Navy yards contracted for machine tools last week, one of them for 10 lathes. Otherwise, the market in this area slid into the usual year-end lull. Not much action in the way of commitments is expected until after the first of the year. Firms having Government contracts are lining up equipment for early purchase. Sellers also point to a tremendous backlog of obsolete machinery waiting to be replaced with modern cost-cutting machines, once confidence is restored. Much will depend upon the attitude and action of the new Congress. Business men particularly would like to see Congress resume a more direct control over Government spending.

Hopkins, The Spender, Takes Roper's Post

WASHINGTON. — Harry L. Hopkins, who as WPA administrator during the past five years has spent more Federal money than any other single individual in the country's history, was sworn in as Secretary of Commerce last week, succeeding Daniel C. Roper, resigned.

Already, grumblings heard in Congress since the appointment was first rumored have subsided appreciably and while there is expected to be some opposition, Mr. Hopkins' confirmation by the Senate is regarded as a foregone conclusion.

Expected to figure prominently while the appointment is before the upper house is the WPA administrator's reputation of disbursing relief funds to communities where the money was calculated to be most effective in influencing votes. Although he has denied ever having made it, his alleged statement, "we will tax and tax, spend and spend, elect and elect" is expected to be revived to haunt the new Secretary of Commerce while his confirmation is pending in the Senate.

Typical editorial reaction to the appointment is reflected in an editorial in the Washington *Post*. Said The *Post*:

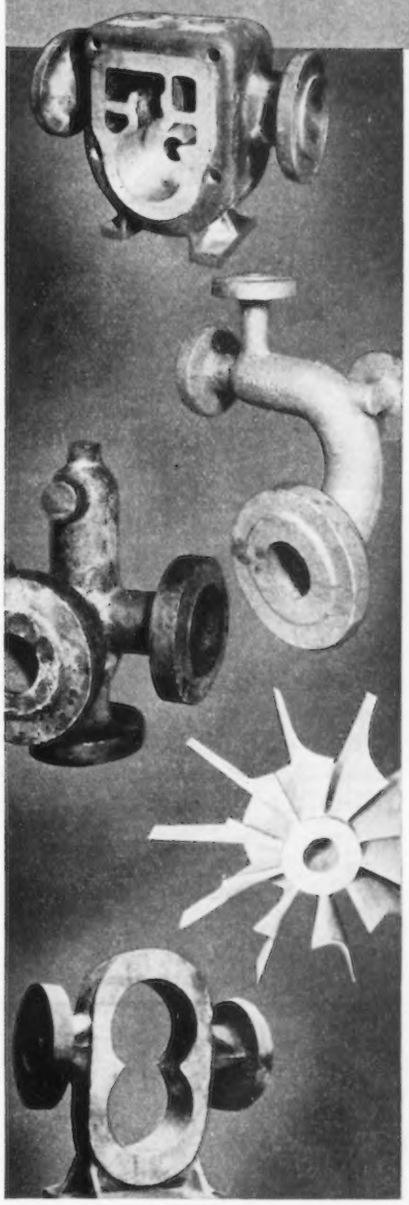
". . . There will be many who will regard the Hopkins appointment as a calculated affront to business, as a tacit way of saying that the business viewpoint is of so little moment to the Administration that refusal to have it represented in the appropriate post is justified."

Other critics go so far as to characterize the appointment as one of spite, but few deny that as a strategic move, by separating Mr. Hopkins from the WPA at a time when its activities are to be subjected to a rigorous going-over by Congress, the appointment is a master political stroke. It throws a blanket of protection over Mr. Hopkins and at the same time assures the Administration that its relief policies will be the target of less criticism. Col. F. C. Harrington, who has directed WPA construction activities for the past three years, has been designated as Mr. Hopkins' successor as WPA administrator.

Japan Builds Machine Tool Experiment Station

WASHINGTON. — An experiment station to test new machine tools for munitions and commercial industries will be in operation in Japan sometime after April 1, 1939, according to a report received at the Commerce Department. Rigid inspection of products has become necessary, the report says, because of the increase in number of shops under "the impetus of prevailing conditions."

7 REASONS WHY YOU CAN SAVE MONEY WITH STEEL CASTINGS



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1 Uniform structure throughout — for greater strength, shock and stress resistance.

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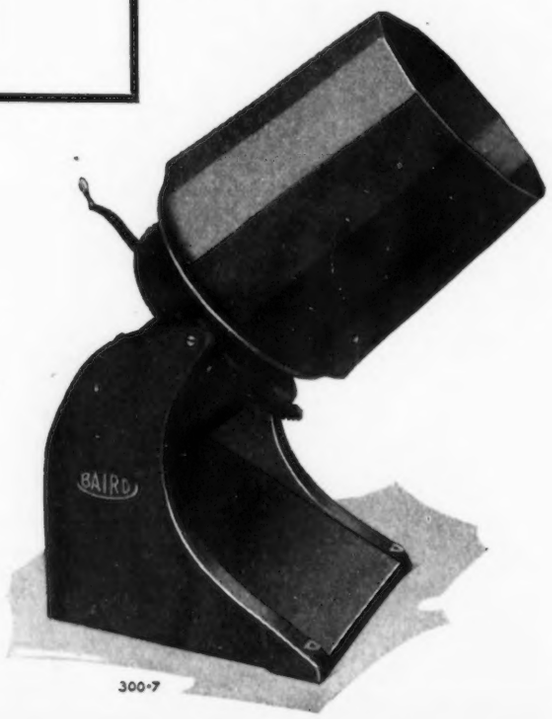

THIS NEW MODEL of Tilting Tumbling Barrel is designed to meet present-day requirements for a machine that is safe, consumes least power, and requires least amount of floor space together with the ability to tilt barrel to angle best suited to the work as well as quick and easy loading and unloading.

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Centrifugally Cast Bronze Bushings

Stock sizes in all lengths up to six feet and in outside diameters 2 to 6 inches

SHENANGO-PENN MOLD CO., Oliver Bldg., Pittsburgh, Pa.

Plants at Dover, Ohio and Sharpsville, Pa.

LUCAS "PRECISION"

Horizontal Boring Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

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CLEVELAND, OHIO, U.S.A.

LELAND-GIFFORD COMPANY

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Drilling Machinery

Belt and Motor Spindle

One to Six Spindles

Tapping Attachments and Multiple Heads

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PRODUCTS INDEX

WHO MAKES IT

Here you find a weekly listing of hundreds of products with the names and addresses of manufacturers. The advertisements of these companies appear in The Iron Age.

ABRASIVE WHEELS — See Grinding Wheels

ABRASIVE CLOTH & PAPER
Norton Co., Worcester, Mass.

ABRASIVES—Steel Shot and Grit
Harrison Abrasive Corp., Manchester, N. H.
Pittsburgh (Pa.) Crushed Steel Co.
Steel Shot & Grit Co., Boston, Mass.

ACCESSORIES—Welding
Lincoln Electric Co., The, Cleveland.

ACCUMULATORS—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Hydraulik Gmbh, Duisburg, Germany.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Wood, R. D., & Co., Philadelphia.

ACETYLENE—Dissolved in Cylinders & Small Tanks
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

ACID-PROOF CEMENT
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

AIR CONDITIONING EQUIPMENT
American Blower Corp., 6000 Russell St., Detroit, Mich.

AIR TANKS AND CYLINDERS
Scaife, William B., & Sons Co., Ptgh.

ALLOYS—Copper
American Brass Co., The, Waterbury, Conn.

ALLOYS—Ferro
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

ALLOYS—Magnesium
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ALLOYS—Phosphor Bronze
Phosphor Bronze Smelting Co., The, Phila.

ALLOYS—Titanium
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

ALLOYS—Zinc Base Die Casting
Gardiner Metal Co., 4884 S. Campbell Ave., Chicago.
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ALUMINUM
Aluminum Co. of America, Pittsburgh.

AMMETERS & VOLTMETERS
General Electric Co., Schenectady, N. Y.
Weston Electrical Instrument Corp., Newark, N. J.

AMMETERS AND VOLTMETERS—Recording
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

AMMONIA RECOVERY PLANTS
Koppers Co., Pittsburgh.

ANGLES, BEAMS, CHANNELS AND TEES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago
Steel & Tubes, Inc., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

ANGLES, BEAMS, CHANNELS & TEES —Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ANNEALING—See Heat Treating

ANNEALING BOXES
United Engineering & Fdry. Co., Ptgh.

ANNEALING COVERS
Continental Roll & Steel Fdry. Co., East Chicago, Ind.

ANODES—Lead
National Lead Co., 111 Bdway., N. Y. C.

APPAREL—Welding
Lincoln Electric Co., The, Cleveland.

ARBORS
Cincinnati (Ohio) Milling Mch. Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

ARMORING MACHINERY—Cable, Wire, Hose
Sleeper & Hartley, Inc., Worcester, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., Chicago.

AXLES—Car or Locomotive
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BABBITT METALS
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cramp Brass & Iron Foundries Co., Philadelphia.
Gardiner Metal Co., 4884 S. Campbell Ave., Chicago.
National Lead Co., 111 Bdway., N. Y. C.

BALANCING MACHINES — Static Dynamic
Olsen, Tinius, Testing Machine Co., Philadelphia.

BALING PRESSES—Scrap — See Presses —Baling

BALLS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.
New Departure Div., General Motors Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Strom Steel Ball Co., Cicero, Ill.

BANDS—Steel
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BANDS—Welded
American Welding & Mfg. Co., Warren, Ohio.

BARRELS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.

BARRELS—Tumbling
Baird Mch. Co., The, Bridgeport, Conn.
Hartford (Conn.) Steel Ball Co., The.
Whiting Corp., Harvey, Ill.

BARS—Alloy
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Cleveland, Ohio.

BARS—Aluminum
Aluminum Co. of America, Pittsburgh.

BARS—Brass, Bronze or Copper
Bunting Brass & Bronze Co., Toledo, Ohio.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BARS—Cold Drawn
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Jones & Laughlin Steel Corp., Pittsburgh.
La Salle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

BARS—Concrete, Reinforcing
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Philadelphia.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

BARS—Rustless
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

BARS—Steel
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Steel & Tubes, Inc., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

BATTERIES—Storage
Electric Storage Battery Co., The, Phila.

BATTERY CHARGERS
Cutler-Hammer, Inc., Milwaukee.

BEAMS—See Angles, Beams, Channels and Tees

BEARINGS—Babbitt
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BEARINGS—Ball
Bantam Bearings Corp., The, South Bend, Ind.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., Poughkeepsie, N. Y.

BEARINGS, Brass and Bronze
Ampco Metal, Inc., Milwaukee, Wisc.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.

BEARINGS—Oilless
Bunting Brass & Bronze Co., Toledo, O.
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Quill
Bantam Bearings Corp., The, South Bend, Ind.

BEARINGS—Radial
Bantam Bearings Corp., The, South Bend, Ind.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Div., General Motors Corp. Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y

BEARINGS—Roll Neck
Bantam Bearings Corp., The, South Bend, Ind.
Morgan Construction Co., Worcester, Mass
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton O.

BEARINGS—Roller
Bantam Bearings Corp., The, South Bend, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller Tapered
Bantam Bearings Corp., The, South Bend, Ind.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Rolling Mill Equipment
Bantam Bearings Corp., The, South Bend, Ind.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Shaft Hanger
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BEARINGS—Thrust
Bantam Bearings Corp., The, South Bend, Ind.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Div., General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Timken Roller Bearing Co., The, Canton, O.

BELT—Conveyor, Elevator
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BELTING—Metal, Conveyor, High and Low Temperature
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

BELTING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BELTS—V-Type
Allis-Chalmers Mfg. Co., Milwaukee.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BENDING MACHINES—Hand, Band and Angle
Excelsior Tool & Mch. Co., E. St. Louis, Ill.

BENDING MACHINES—Hand and Power
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Niagara Machine & Tool Works, Buffalo, N. Y.

BENZOL RECOVERY PLANTS
Koppers Co., Pittsburgh.

BERYLLIUM COPPER
American Brass Co., The, Waterbury, Conn.

BILLETS—Alloy
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.

BILLETS—Carbon
Harrisburg (Pa.) Steel Corp.

BILLETS—Chrome Nickel Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Chrome Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Forging
Alan Wood Steel Co., Conshohocken, Pa.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio.

BILLETS—Re-rolling
Alan Wood Steel Co., Conshohocken, Pa.

BILLETS—Steel
Bethelhem (Pa.) Steel Company.
Continental Steel Corp., Kokomo, Ind.
Harrisburg (Pa.) Steel Corp.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BLANKS—Chisel
Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

BLANKS—Gear and Pinion
American Welding & Mfg. Co., Warren, Ohio.
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

PRODUCTS INDEX

BLAST FURNACE SPECIALTIES
Bailey Wm. M., Co. Pittsburgh.

BLAST FURNACES
Brassert, H. A., & Co., Chicago, Ill.

BLAST GATES
R-S Products Corporation, Phila., Pa.
Rockwell, W. S., Co., 50 Church St.,N.Y.C.

BLOCKS—Chain
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

BLOWERS
American Blower Corp., 6000 Russell St., Detroit, Mich.
Buffalo (N. Y.) Forge Co., 492 Broadway.
Ingersoll-Rand Co., 11 Broadway, N. Y. C.

BLOWERS—Rotary & Centrifugal
Roots-Connersville Blower Corp., Connersville, Ind.

BLOWPIPES—Oxy-Acetylene Welding & Cutting
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

BLOWPIPES — Soldering, Heating, Annealing
American Gas Furnace Co., Elizabeth, N.J.

BOILERS
Munroe R., & Sons Mfg. Corp., Pittsburgh.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

BOLT CUTTERS
Landis Mch. Co., Inc., Waynesboro, Pa.

BOLT AND NUT MACHINERY
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Euclid, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

BOLT POINTING MACHINES
Acme Machinery Co., The, Cleveland.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage and Machine
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) Bolt & Nut Co.
Lamson & Sessions Co., The, Cleveland.
Oliver Iron & Steel Corp., Pittsburgh.

BOLTS—Special
Erie (Pa.) Bolt & Nut Co.
Lamson & Sessions Co., The, Cleveland.
Oliver Iron & Steel Corp., Pittsburgh.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland.
Oliver Iron & Steel Corp., Pittsburgh.

BOLTS—Stove
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., Torrington, Conn.

BOLTS—Stove, Recessed Head
American Screw Co., Providence, R. I.

BOLTS—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BOLTS AND NUTS
American Screw Co., Providence, R. I.
Clark Bros. Bolt Co., Millidale, Conn.
Erie (Pa.) Bolt & Nut Co.
Lamson & Sessions Co., The, Cleveland.
Oliver Iron & Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.

BOLTS AND NUTS—Self Locking
Lamson & Sessions Co., The, Cleveland.

BOND—Grinding Wheel
Bakelite Corp., 247 Park Ave., N. Y. C.

BORING BARS
Bullard Co., The, Bridgeport, Conn.

BORING, DRILLING & MILLING MACHINES—Horizontal
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
Lucas Machine Tool Co., Cleveland.

BORING & DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, Ohio.
Bullard Co., The, Bridgeport, Conn.

BORING MACHINES—Jig
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

BORING & TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Planer Co.

BRAKE LINING AND BLOCKS—Asbestos
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

BRAKES—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Electric & Mechanical
Clark Controller Co., The, Cleveland.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

BRAKES—Metal Forming
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, N. J.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Steelweld Machinery Co., Cleveland.

BRICK—Acid Resisting
Keagler Brick Co., Steubenville, Ohio.

BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N. Y.
Illinois Clay Products Co., Joliet, Ill.
Keagler Brick Co., Steubenville, Ohio.

BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

BRIDGE BUILDERS
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Philadelphia.

BRIQUETS—Ferroalloy
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

BROACHES
Colonial Broach Co., Detroit.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Milling Mch. Co., The.
Colonial Broach Co., Detroit.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

BRONZE FOR DIES
Ampco Metal, Inc., Milwaukee, Wisc.

BRONZE—Phosphor
Bunting Brass & Bronze Co., Toledo, Ohio.
Phosphor Bronze Smelting Co., The, Phila.

BUCKETS—Clamshell
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Hayward Co., The, 50 Church St.,N. Y. C.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS—Electric Motor
Hayward Co., The, 50 Church St.,N. Y. C.

BUCKETS—Orange Peel
Hayward Co., The, 50 Church St.,N. Y. C.

BUFFERS & POLISHING MACHINES
Packer Machine Co., The, Meriden, Conn.

BUFFING APPLIGATORS—Automatic
Packer Machine Co., The, Meriden, Conn.

BUILDINGS—Steel
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Iron & Steel Products, Inc., Chicago.

BULLDOZERS
Ajax Mfg. Co., The, Euclid, Ohio.
Steelweld Machinery Co., Cleveland.

BURNERS—Oil or Gas
Kemp, C. M., Mfg. Co., The, Baltimore, Md.

BURRING MACHINES
Acme Machinery Co., The, Cleveland.

BUSHINGS—Bronze
Ampco Metal, Inc., Milwaukee, Wisc.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
Phosphor Bronze Smelting Co.,The, Phila.
Shenango-Penn Mold Co., Dover, Ohio.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
Bunting Brass & Bronze Co., Toledo, Ohio.
Phosphor Bronze Smelting Co.,The, Phila.

BY-PRODUCTS COKE AND GAS OVENS
Koppers Co., Pittsburgh.

CABLE—Electric
General Electric Co., Schenectady, N. Y
Lincoln Electric Co., The, Cleveland.

CABLEWAYS AND TRAMWAYS—See Tramways

CALCIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CARBIC
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARRIDE
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE—Boron
Norton Co., Worcester, Mass.

CARBURIZING—See Heat Treating

CARS—Railway
Iron & Steel Products, Inc., Chicago.

CARS—Industrial and Mining
Atlas Car & Mfg. Co., The, Cleveland.

CASE HARDENING—See Heat Treating

CASTINGS—Acid or Heat Resisting
Ampco Metal, Inc., Milwaukee, Wisc.
Cramp Brass & Iron Foundries Co., Philadelphia.
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Hoskins Mfg. Co., Detroit, Mich.
Meehanite Metal Corp., Pittsburgh.

CASTINGS—Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
Forging & Casting Corp., The, Ferndale, Mich.

CASTINGS—Alloy Steel
Advance Foundry Co., The, Dayton, Ohio
Hartford (Conn.) Electric Steel Corp.

CASTINGS—Aluminum
Aluminum Co. of America, Pittsburgh.
Frontier Bronze Corp., 818 Ellwood Ave., Niagara Falls, N. Y.

CASTINGS—Brass, Bronze, Copper or Aluminum
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Carbon Malleable Casting Co., Inc., Lancaster, Pa.
Cramp Brass & Iron Foundries Co., Philadelphia.
Frontier Bronze Corp., 818 Ellwood Ave., Niagara Falls, N. Y.
National Bearing Metals Corp., Pittsburgh.
Phosphor Bronze Smelting Co.,The, Phila.
Shenango-Penn Mold Co., Dover, Ohio.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—Corrosion Resisting
Cramp Brass & Iron Foundries Co., Philadelphia.
Meehanite Metal Corp., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.

CASTINGS—Die
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS—Die, Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Electric Steel
Crucible Steel Castings Co., Lansdowne, Pa.

CASTINGS—Gray Iron
Advance Foundry Co., The, Dayton, Ohio.
American Engineering Co., Philadelphia.
Chambersburg (Pa.) Engineering Co.
Commercial Steel Casting Co., Marion Ohio.
Cramp Brass & Iron Foundries Co., Philadelphia.
Dodge Mfg. Co., Mishawaka, Ind.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Murray Iron Wks. Co., Burlington, Iowa.
National Roll & Fdry. Co., Avonmore, Pa.
North Wales (Pa.) Mach. Co., Inc.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—High Test & Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
Meehanite Metal Corp., Pittsburgh.

CASTINGS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

CASTINGS—Malleable
Carbon Malleable Casting Co., Inc., Lancaster, Pa.
Lake City Malleable Co., The, 5100 Lakeside Ave., Cleveland.
Malleable Iron Fittings Co., Branford, Ct.
Peoria (Ill.) Malleable Castings Co.

CASTINGS—Meehanite Metal
Meehanite Metal Corp., Pittsburgh.

CASTINGS—Monel & Nickel
Cramp Brass & Iron Foundries Co., Philadelphia.
Frontier Bronze Corp., 818 Ellwood Ave., Niagara Falls, N. Y.

CASTINGS—Semi-Steel
Cramp Brass & Iron Foundries Co., Philadelphia.
Malleable Iron Fittings Co., Branford, Ct.

CASTINGS—Steel
Bethlehem (Pa.) Steel Company.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Commercial Steel Casting Co., Marion, Ohio.
Crucible Steel Castings Co., Lansdowne,Pa.
Hartford (Conn.) Electric Steel Corp.
Malleable Iron Fittings Co., Branford, Ct.
Mesta Mch. Co., Pittsburgh.
Standard Steel Wks. Co., Burnham, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS—Wear Resisting
Meehanite Metal Corp., Pittsburgh.

CEMENT—Acid-Proof
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CEMENT—Refractory
Carborundum Co., The, Perth Amboy, N. J.
Johns-Manville Corp., [illegible] 40th St., New York City.

CEMENT—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

CENTERING MACHINES
Hendey Machine Co., Torrington, Conn.

CHAINS—Conveyor & Elevator
Baldwin-Duckworth Chain Corp., Springfield, Mass.

CHAINS—Power Transmission
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Ramsey Chain Co., Inc., Albany, N. Y.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Roller
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—Silent
Ramsey Chain Co., Inc., Albany, N. Y.
Whitney Chain & Mfg. Co., Hartford, Ct.

CHANNELS—See Angles, Beams, Channels and Tees

CHECKS—Metal
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

CHEMICALS—Industrial
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CHROMIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CHUCKING MACHINES—Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.
Goss & DeLeeuw Machine Co., New Britain, Conn.
National Acme Co., The, Cleveland.
Potter & Johnston Machine Co., Pawtucket, R. I.

CHUCKS—Air Operated
Hannifin Mfg. Co., Chicago.

CHUCKS—Drill
Cleveland (Ohio) Twist Drill Co., The.
Cushman Chuck Co., Hartford, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

CHUCKS—Drill, Quick Change
Apex Machine & Tool Co., The, Dayton, Ohio.

CHUCKS—Electric
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Lathe
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Magnetic
Taft-Peirce Mfg. Co.,The,Woonsocket,R.I.

CHUCKS—Tapping
Apex Machine & Tool Co., The, Dayton, Ohio.

CIRCLES—Phosphor Bronze
Phosphor Bronze Smelting Co.,The, Phila.

CLAY GUNS
Bailey, Wm. M., Co., Pittsburgh.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Ford, J. B., Co., The, Wyandotte, Mich.
Pennsylvania Salt Mfg. Co., Phila., Pa.

CLEANING COMPOUNDS—Alkali
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CLEANING EQUIPMENT (METAL)—Electro-Chemical
Bullard Co., The, Bridgeport, Conn.

CLOTHING—Asbestos & Fireproof
Safety Equipment Service Co., Cleveland.

CLUTCH-BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES
Fairbanks, Morse & Co., Chicago.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Hilliard Corp., The, Railroad Ave., Elmira, New York.
Medart Co., The, St. Louis, Mo.

CLUTCHES—Friction
Dodge Mfg. Co., Mishawaka, Ind.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES—Overrunning
Hilliard Corp., The, Railroad Ave., Elmira, New York.

COAL
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Koppers Coal Co., The, Pittsburgh.
Pickands Mather & Co., Cleveland.

PRODUCTS INDEX

COBALT METAL
Central Trading Corp., 711 Fifth Ave., N. Y. C.

COILS—Lead
National Lead Co., 111 Bdway., N. Y. C.

COILS—Pipe
Harrisburg (Pa.) Steel Corp.

COKE—Metallurgical
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Piekands Mather & Co., Cleveland.

COKE OVEN MACHINERY
Atlas Car & Mfg. Co., The, Cleveland.
Koppers Co., Pittsburgh.

COKE OVENS—By-Products
Koppers Co., Pittsburgh.

COKE OVENS—Cross Regenerators
Koppers Co., Pittsburgh.

COKE OVENS—With Recovery of By-Products
Koppers Co., Pittsburgh.

COLD ROLL FORMING MACHINES
McKay Machine Co., The, Youngstown, Ohio.

COLLETS—Drill
Apex Machine & Tool Co., The, Dayton Ohio.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

COMBUSTION CONTROLS
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Morgan Construction Co., Worcester, Mass.

COMPOUNDS—Drawing
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

COMPRESSORS—Air
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Fairbanks, Morse & Co., Chicago.
Ingersoll-Rand Co., 11 Broadway, New York City.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.
Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—Gas
Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—Rebuilt. (See Clearing House Section)

CONDENSERS—Surface & Jet
Ingersoll-Rand Co., 11 Broadway, N.Y.C.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS—Flexible Metallic
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

CONTRACTORS' SUPPLIES — Second-Hand. (See Clearing House Section)

CONTROL SYSTEMS—Temperature
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLLERS—Crane
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.

CONTROLLERS—Valve, Electrically Operated
Cutler-Hammer, Inc., Milwaukee.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Vickers, Inc., 1420 Oakman Blvd., Detroit.

CONTROLS—Time Cycle
Koppers Co., Western Gas Div., Fort Wayne, Ind.

CONVEYING AND ELEVATING MACHINERY
Farquhar, A. B., Co., Ltd., York, Pa.
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—Gravity
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

CONVEYORS—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

CONVEYORS—Portable
Farquhar, A. B., Co., Ltd., York, Pa.

COPING MACHINES
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORE OIL
Penola, Inc., Pittsburgh.
Sun Oil Co., Philadelphia.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS — See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, Cleveland.
Western Wire Prods. Co., St. Louis, Mo.

COUNTERBORES
Cleveland (Ohio) Twist Drill Co., The.
Gairing Tool Co., Detroit.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Veeder-Root, Inc., Hartford, Ct.

COUNTING MACHINES
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS—Cut-off Friction
Hilliard Corp., The, Railroad Ave., Elmira, New York.

COUPLINGS—Flexible
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Lovejoy Flexible Coupling Co., Chicago.
Poole Foundry & Mch. Co., Baltimore, Md.
Ramsey Chain Co., Inc., Albany, N. Y.

COUPLINGS—Pipe
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—Crawling Tractor
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

CRANES — Electric, Industrial, Truck Mounted
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANES—Electric Traveling
Armel, James P., Pittsburgh.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Conco Engineering Works, Mendota, Ill.
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Electric Hoist & Motor Co., 149 N. 9th St., Bklyn., N. Y.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Maris Brothers, Inc., Philadelphia.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, Detroit, Mich.
Payne, N. B., 105 West 55th St., N. Y. C.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Gantry
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Morgan Engineering Co., The, Alliance, O.
Whiting Corp., Harvey, Ill.

CRANES—Hand Power
American Monorail Co., The, Cleveland.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Conco Engineering Works, Mendota, Ill.
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Maris Brothers, Inc., Philadelphia.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Whiting Corp., Harvey, Ill.

CRANES—Jib
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of the Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Conco Engineering Works, Mendota, Ill.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

CRANES—Locomotive
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.

JUST BETWEEN US TWO

Vale, 1938!

With '38 fast nearing its last—and probably heavily alcoholic—breath, this is a good time to consider New Year resolutions.

Being well satisfied with things as they are, we can't think of any for ourself. This column started the year with eighteen readers and ends with the same imposing figure; a survey reveals that the feeling against the phrase "favorite family journal" is intense only in a small area, so we will continue using it; and we have enough puzzles to last us from now on.

Altogether it has been a successful year. The only resolution we can think of that is worth making is in the name of those porcine souls who ask their operator to get you on the telephone and then take their own good time in answering a call initiated by themselves. The resolution is, of course, that they reform or that their vocal cords shrivel.

Prof Barges In

A good way to get yourself quoted is to repress any squeamish fear of not hitting the truth on the nose, and to tear into something on all fours. Professor Malcolm P. McNair of the Harvard Graduate School of Business Administration shows how. Sezzee:

> *"If we still had a lot of ignorant business enterprisers who never heard of the business cycle and who did not subscribe to any tip sheets, either political or economic, who were not concerned with precise calculation of consumer demand by means of market surveys and so on, but who barged in bull-headedly on the assumption that this is a rich country and that the future is going to be bigger and better than the past, we should not have to worry about a business recovery."*

The words are warm and brave, but upon second reading there is less in them than there seems to be. The blanket indictment of market surveys is unwarranted. The absence of tip sheets, following the depressions of '93 and '07, induced few to barge in bullheadedly, and did the presence of tip sheets in '29 move many to barge out in advance of the official bust-up?

Our Man Overdoes It

Ever since peg top pants were in bloom a certain firm has been advertising modestly in your favorite family journal. Thinking it about time the space discarded its teething ring, our representative called and this happened:

> *Our man: "Mr. Blank, why not try using larger space?"*
>
> *Mr. Blank: "Young man, I went all through that with one of your representatives back in 1914, so why bring it up again?"*
>
> *Our man: "Pardon me, Mr. Blank. I don't want to be a pest."*

Transformer

"What is often called indolence is in fact the unconscious consciousness of incapacity." Dictaphone's "It's Said and Done" yields that gem.

Incapacity is, of course, largely a state of mind which fluctuates, in the same individual, from day to day like an ammeter on a Model T Ford. Inspire your subject by exposing him to the record of a great and inspiring performance, as for instance next week's Annual Number, and his consciousness of capacity zooms.

Our Public Ecstasizes

This week's fan mail is a letter from John Thwaites of Beatty Bros. Ltd., Fergus, Ont., reading, *"I have waded through your column with mixed emotion for some considerable time."* We don't see how one emotion can be mixed, and are reminded of the boy who said, pointing to two kinds of candy, *"A penny's worth of this and a penny's worth of that—and mix 'em."* The shopkeeper replied, *"You get one of each. Mix 'em yourself."*

But to get back to Mr. Thwaites. He says the problems are too easy and wants something tougher to gnaw on. Here's a stringy one from Charley (Hoskins Mfg.) Kinnison:

> *Expressed in terms of Pi, what is the surface area of a sphere which will just encompass an equilateral tetrahedron whose side is 8 in.*

You Can Do It Even With a Hangover

Our own preference is the easy old favorites that you solve in ten seconds and forget in twenty, like this one submitted by A.D.W.:

> *A man had a fox, a sack of grain and a duck to get across a river. He could carry only one at a time in his boat, and couldn't leave the fox alone with the duck, or the duck alone with the grain.*

Happy New Year! —A.H.D.

PRODUCTS INDEX

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, O.

CRANES—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Reading (Pa.) Chain & Block Corp.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Portable
Canton Fdry. & Mch. Co., Cleveland.

CRANES—Portable Electric
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANKSHAFTS
Transue & Williams Steel Forging Corp., Alliance, Ohio
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

CRANKSHAFTS—Forged
Bay City Forge Co., Erie, Pa.
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.

CRUSHERS—Coal
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CRUSHERS—Steel Turning
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CUTTERS—Die Sinking
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Tomkins-Johnson Co., The, Jackson, Mich.

CUTTERS—Keyseating
Davis Keyseater Co., 400 Exchange St. Rochester, N. Y.

CUTTERS—Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland (Ohio) Twist Drill Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

CUTTING-OFF MACHINES—Abrasives
Tabor Mfg. Co., Phila.

CUTTING-OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.

CUTTING-OFF MACHINES—Pipe or Tubing
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Bardons & Oliver, Cleveland.
Cox & Sons Co., The, Bridgeton, N. J.
Landis Mch. Co., Inc., Waynesboro, Pa.

CUTTING AND WELDING APPARATUS—Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene.

CYLINDERS — Compressed Air & Hydraulic
Hanna Engineering Works, 1761 Elston Ave., Chicago.
Tomkins-Johnson Co., The, Jackson, Mich.

CYLINDERS—Seamless
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Tube Co. (U. S. Steel Corp Subsidiary), Pittsburgh.

DEGREASING COMPOUNDS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

DIE BLOCKS—Drop Hammer
Heppenstall Co., Pittsburgh.
Kropp Forge Co., Chicago, Ill.

DIE SETS
U. S. Tool Co., Inc., Ampere, N. J.

DIE SINKING MACHINES — Automatic and Hand
Cincinnati (Ohio) Milling Mch. Co., The.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

DIE STOCKS
Ridge Tool Co., Elyria, Ohio.

DIEING MACHINES—Automatic
Henry & Wright Mfg. Co., The, Hartford, Conn.

DIES, JIGS, FIXTURES, etc.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

DIES—Cast Tool Steel
Advance Foundry Co., The, Dayton, Ohio.
Forging & Casting Corp., The, Ferndale, Mich.

DIES—Pipe Threading
Acme Machinery Co., The, Cleveland.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Screw and Thread Cutting
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., The, New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Sheet Metal Working
Ferracute Machine Co., Bridgeton, New Jersey.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

DIES—Steel Letters and Stamps
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

DOORS & SHUTTERS, Fireproof
Kinnear Mfg. Co., Columbus, Ohio.

DOORS & SHUTTERS—Steel or Wood Rolling
Kinnear Mfg. Co., Columbus, Ohio.

DRAW BENCHES
McKay Machine Co., The, Youngstown, Ohio.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRILL HEADS—Multiple
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Bench
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Heavy Duty
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Multiple Spindle
Baker Bros., Inc., Toledo, Ohio.
Henry & Wright Mfg. Co., The, Hartford, Conn.

DRILLING MACHINES—Multiple Spindle Horizontal
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.
Millers Falls Co., Greenfield, Mass.

DRILLING MACHINES—Portable Pneumatic
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., 11 Broadway, New York City.
Warner & Swasey Co., The, Cleveland.

DRILLING MACHINES—Radial
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.

DRILLING MACHINES—Sensitive
Buffalo (N. Y.) Forge Co., 492 Broadway.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Upright
Baker Bros., Inc., Toledo, Ohio.
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Machine Tool Co., Green Bay, Wisc.

DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, Ohio.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Machine Tool Co., Green Bay, Wisc.

DRIVES—Gear
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.

DRIVES—Single & Multiple V-Belts
Allis-Chalmers Mfg. Co., Milwaukee.

DROP FORGINGS—See Forgings—Drop Iron or Steel

DROP HAMMERS—See Hammers—Drop

DUST COLLECTORS
Abrasive Machine Tool Co., East Providence, R. I.
American Blower Corp., 6000 Russell St., Detroit, Mich.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Whiting Corp., Harvey, Ill.

ECONOMIZERS
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

ELECTRIC LIGHTING—Industrial
General Electric Co., Cleveland.
General Electric Vapor Lamp Co., Hoboken, N. J.

ELECTRIC WELDING — See Welding — Electric

ELECTRICAL EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee.

ELECTRICAL MACHINERY — Second Hand. (See Clearing House Section)

ELECTRICAL WIRES
Roebling's, John A., Sons Co., Trenton, N. J.

ELECTRODE HOLDERS—Welding
Lincoln Electric Co., The, Cleveland.

ELECTRODES—Welding, Coated
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.

ELECTROPLATING—Bright Nickel
Bright Nickel Corp., Detroit, Mich.

EMERY WHEELS—See Grinding Wheels

ENGINEERS—Consulting and Industrial
Hunt, C. H., Pittsburgh, Pa.
Koppers Co., Pittsburgh.

ENGINES—Diesel
Ingersoll-Rand Co., 11 Broadway, N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES—Gas
Fairbanks, Morse & Co., Chicago.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES—Oil
Worthington Pump & Machinery Corp., Harrison, N. J.

EYELET MACHINES
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

FACERS—Spot
Gairing Tool Co., Detroit.

FACING CLAY
Carborundum Co., The, Perth Amboy, N.J.

FACTORY & PLANT SITES
Zoll, Edward H., Inc., 196 Market St Newark, N. J.

FANS—Cooling
South Bend (Ind.) Air Products, Inc.

FANS—Ventilating
American Blower Corp., 6000 Russell St., Detroit, Mich.
Buffalo (N. Y.) Forge Co., 492 Broadway.
South Bend (Ind.) Air Products, Inc.

FEED WATER HEATERS AND PURIFIERS
Harrisburg (Pa.) Steel Corp.

FEEDS—Hydraulic, for Machines
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

FELT—Wool Mechanical
American Felt Co., 315 Fourth Ave., N.Y.C.

FENCING—Wire
Pittsburgh (Pa.) Steel Co.

FERROALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

FERROMANGANESE
Bethlehem (Pa.) Steel Co.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank & Co., Inc., Philadelphia.

FERROSILICO MANGANESE
Ohio Ferro-Alloys Corp., Canton, Ohio.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

FERROSPIEGELEISEN
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

FERROTITANIUM
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E 42nd St., N. Y. C.

FILES & RASPS
Disston, Henry, & Sons, Inc., Philadelphia.
Nicholson File Co., Providence, R. I.

FILING MACHINES
Continental Machine Specialties, Inc., Minneapolis, Minn.

FILTER CLOTH—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

FILTERS—OIL
Cuno Engineering Corp., Meriden, Conn.
National Acme Co., The, Cleveland.

FILTERS—Pressure or Gravity
Scaife, Wm. B., & Sons Co., Pittsburgh.

FIRE BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

FIRE CLAY
Carborundum Co., The, Perth Amboy, N. J.
Illinois Clay Products Co., Joliet, Ill.
Keagler Brick Co., Steubenville, Ohio.

FITTINGS—Brass, Pipe and Tube
Commonwealth Brass Corp., Detroit.

FLANGES—Forged Steel
Harrisburg (Pa.) Steel Corp.
Kropp Forge Co., Chicago, Ill.
Standard Steel Wks. Co., Burnham, Pa.

FLANGES—Welded Steel
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

FLANGING WORK—Carbon and Alloy
Worth Steel Co., Claymont, Del.

FLEXIBLE SHAFT EQUIPMENT
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Lovejoy Flexible Coupling Co., Chicago.

FLOODLIGHTS—Acetylene
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FLOOR PLATES—See Plates—Floor or Cellar Door

FLOORING—Acid Proof
Nukem Products Corp., 68 Niagara St. Buffalo, N. Y.

FLOORING—Monolithic
Johns-Manville Corp., 22 East 40th St New York City.

FLOORING—Open Steel
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.

FLUX—Welding
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FORGING MACHINES—Roll
Ajax Mfg. Co., The, Euclid, Ohio.

FORGING MACHINES—Upset
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Euclid, Ohio.

FORGINGS—Alloy Steel
Heppenstall Co., Pittsburgh.
Kropp Forge Co., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

FORGINGS—Brass, Bronze or Copper
American Brass Co., The, Waterbury, Conn.
Commonwealth Brass Corp., Detroit.
Cramp Brass & Iron Foundries Co., Philadelphia.
Titan Metal Mfg. Co., Bellefonte, Pa.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., Erie, Pa.
Billings & Spencer Co., Hartford, Conn.
Canton (Ohio) Drop Forging & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Forging & Casting Corp., The, Ferndale, Mich.
Kropp Forge Co., Chicago, Ill.
Poor & Co., Canton Forge & Axle Wks., Canton, Ohio
Rockford (Ill.) Drop Forge Co.
Storms Drop Forging Co., Springfield, Mass.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Hollow
Harrisburg (Pa.) Steel Corp.
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Company.
Kropp Forge Co., Chicago, Ill.
Mesta Mch. Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa
Standard Steel Wks. Co., Burnham, Pa.

FORGINGS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

FORGINGS—Upset
Bethlehem (Pa.) Steel Company.
Kropp Forge Co., Chicago, Ill.
Lamson & Sessions Co., The, Cleveland.
Rockford (Ill.) Drop Forge Co.

FOUNDRY EQUIPMENT & SUPPLIES
Whiting Corp., Harvey, Ill.

FURNACES—Billet or Ingot Heating
Flinn & Dreffein Co., Chicago.
Salem (Ohio) Engineering Co.

FURNACES—Brass Melting
Monarch Engineering & Mfg. Co., The, Baltimore, Md.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Electric, Steel Melting
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Lectromelt Furnace Corp.

FURNACES—Enameling
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, Ohio.
General Electric Co., Schenectady, N. Y.

PRODUCTS INDEX

FURNACES—Forging
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Automatic
Amer. Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, Ohio.
Holcroft & Co., Detroit.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Rockwell, W. S., Co., 50 Church St., N.Y.C
R-S Products Corporation, Phila., Pa.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Cyanide or Lead
Electric Furnace Co., The, Salem, Ohio.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Electric
Electric Furnace Co., The, Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Rockwell, W. S., Co., 50 Church St., N.Y.C
R-S Products Corporation, Phila., Pa.
Salem (Ohio) Engineering Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES—Heat Treating, Oil or Gas
American Gas Furnace Co., Elizabeth, N. J.
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Electric Furnace Co., The, Salem, Ohio.
Flinn & Dreffein Co., Chicago.
Holcroft & Co., Detroit.
Kemp, C. M., Mfg. Co., The, Baltimore, Md.
Monarch Engineering & Mfg. Co., The, Baltimore, Md.
Pennsylvania Industrial Engineers, Pittsburgh.
Rockwell, W. S., Co., 50 Church St., N.Y.C.
R-S Products Corporation, Phila., Pa.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Pack Heating Sheets
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

FURNACES—Rivet Heating, Gas
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Wire, Annealing and Galvanizing
General Electric Co., Schenectady, N. Y.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

GAGE BLOCKS
Ford Motor Co. (C. E. Johansson Division), Dearborn, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GAGES—Electric
Sheffield Gage Corp., Dayton, Ohio.

GAGES—Plug and Snap
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

GAGES—Thickness, for Rolling Mills
Haines Gauge Co., The, Phila., Pa.

GAGES—Thread Lead
Jones & Lamson Mch. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.

GAGES—Temperature
Weston Electrical Instrument Corp., Newark, N. J.

GALVANIZING
Cattie, Joseph P., & Bros., Phila.

GALVANIZING COMPOUNDS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

GALVANIZING PLANTS—For Sheets
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Erie (Pa.) Foundry Co.

GAS ANALYSIS RECORDERS
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

GAS—Boosters and Exhausters
Roots-Connersville Blower Corp., Connersville, Ind.

GAS FOR INDUSTRIAL USES
American Gas Association, 420 Lexington Ave., N. Y. C.

GAS PRODUCERS
Flinn & Dreffein Co., Chicago.
Koppers Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., & Co., Philadelphia.

GAS RECOVERY COKE OVENS
Koppers Co., Pittsburgh.

GASKETS—Asbestos, Metal or Rubber
Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

GASKETS—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

GEAR CHECKING EQUIPMENT
Michigan Tool Co., Detroit, Mich.

GEAR CUTTING
Earle Gear & Machine Co., Phila.
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.
Philadelphia (Pa.) Gear Works.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

GEAR CUTTING MACHINES
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.

GEAR DRIVES—Herringbone
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

GEAR HOBBING MACHINES
Barber-Colman Co., Rockford, Ill.

GEAR LAPPING MACHINES
Michigan Tool Co., Detroit, Mich.

GEARMOTORS
Allis-Chalmers Mfg. Co., Milwaukee.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Ptgh.

GEAR PLANNING MACHINES
Gleason Works, Rochester, N. Y.

GEAR SHAVING MACHINES
Michigan Tool Co., Detroit, Mich.

GEARS—Bevel
Gleason Works, Rochester, N. Y.

GEARS—Heat Treated
Gleason Works, Rochester, N. Y.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Herringbone
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Mesta Mch. Co., Pittsburgh.
Philadelphia (Pa.) Gear Works.

GEARS—Machine Cut
Cleveland (Ohio) Worm & Gear Co.
Gleason Works, Rochester, N. Y.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Machine Molded
Poole Foundry & Mch. Co., Baltimore, Md.

GEARS—Non-Metallic
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

GEARS—Spur
Philadelphia (Pa.) Gear Works.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Worm
Cleveland (Ohio) Worm & Gear Co.
Philadelphia (Pa.) Gear Works.

GENERATORS—Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

GENERATORS—Electric
Chicago (Ill.) Electric Co.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh.

GENERATORS—Electric, Second Hand. (See Clearing House Section)

GLOVES—Asbestos & Fireproof
Safety Equipment Service Co., Cleveland.

GOGGLES—Safety
American Optical Co., Southbridge, Mass.
Safety Equipment Service Co., Cleveland.
Willson Products, Inc., Reading, Pa.

GOVERNORS—Air Compressor
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

GRABS—For Sheets and Coils
J-B Engineering Sales Co., 1738 Orange St., New Haven, Conn.

GRATING—Flooring, Sidewalk, etc.—See Flooring—Open Steel

GREASE—Lubricating
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

GRILLES—Metal Cane
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRILLES—Perforated Metal
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRINDING AND POLISHING MACHINES
Black & Decker Mfg. Co., The, Towson, Md.
Bryant Machinery & Engineering Co., Chicago.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Norton Co., Worcester, Mass.
Production Machine Co., Greenfield, Mass.

GRINDING MACHINES—Belt
Production Machine Co., Greenfield, Mass.

GRINDING MACHINES—Centerless
Cincinnati (Ohio) Grinders Incorporated.

GRINDING MACHINES—Chucking
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES — Cutter & Reamer
Cincinnati (Ohio) Milling Mch. Co., The.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Cylindrical
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati (Ohio) Grinders Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Die
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Gear & Worm
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING MACHINES—Hob
Barber-Colman Co., Rockford, Ill.

GRINDING MACHINES—Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Greenfield (Mass.) Tap & Die Corp.

GRINDING MACHINES—Internal Multiple Spindle
Baird Mch. Co., The, Bridgeport, Conn.

GRINDING MACHINES — Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

GRINDING MACHINES—Portable Flexible Shaft
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING MACHINES—Portable Pneumatic
Ingersoll-Rand Co., 11 Broadway, New York City.
Warner & Swasey Co., The, Cleveland.

GRINDING MACHINES—Precision Thread
Jones & Lamson Machine Co., Springfield, Vt.

GRINDING MACHINES—Roll
Cincinnati (Ohio) Grinders Incorporated.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES—Snagging
Black & Decker Mfg. Co., The, Towson, Md.
Warner & Swasey Co., The, Cleveland.

GRINDING MACHINES—Surface
Abrasive Machine Tool Co., E. Prov., R. I.
Blanchard Machine Co., The, Cambridge, Mass.
Norton Co., Worcester, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING MACHINES—Swing Frame
Black & Decker Mfg. Co., The, Towson, Md.
Shuster, F. B., Co., The, New Haven, Conn.

GRINDING MACHINES—Tool
Cincinnati (Ohio) Milling Mch. Co., The.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Universal
Cincinnati (Ohio) Grinders Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Valve
Landis Tool Co., Waynesboro, Pa.

GRINDING WHEELS
Bakelite Corp., 247 Park Ave., N. Y. C.
Blanchard Machine Co., The, Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Norton Co., Worcester, Mass.

GRINDING WHEELS—Segment
Blanchard Machine Co., The, Cambridge, Mass.

GRIT—Steel
Harrison Abrasive Corp., Manchester, N. H.
Pittsburgh (Pa.) Crushed Steel Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES
Armstrong-Blum Mfg. Co., Chicago.

HAMMERS—Air, Forging
Chambersburg (Pa.) Engineering Co.
Nazel Engineering & Machine Works, Philadelphia.

HAMMERS—Chipping & Riveting—Pneumatic
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS—Drop
Billings & Spencer Co., Hartford, Conn.
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HAMMERS—Helve
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Pneumatic
Chambersburg (Pa.) Engineering Co.
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

HAMMERS—Power
Bradley, C. C., & Son, Inc., Syracuse, N. Y.
Chambersburg (Pa.) Engineering Co.

HAMMERS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1306 Elston Ave.

HAMMERS—Steam
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Morgan Engineering Co., The, Alliance, O.

HANGER BEARINGS
Dodge Mfg. Co., Mishawaka, Ind.

HANGERS—Ball Bearing
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.

HANGERS—Pressed Steel
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.

HANGERS—Shaft
Dodge Mfg. Co., Mishawaka, Ind.

HEADING MACHINES
Ajax Mfg. Co., The, Euclid, Ohio.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

HEADS—Spun and Pressed
Worth Steel Co., Claymont, Del.

HEAT TREATING
Barnes-Gibson-Raymond, Detroit Plant Div. of Associated Spring Corp.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
General Machine Wks., York, Pa.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Parish Pressed Steel Co., Reading, Pa.
Pennsylvania Industrial Engineers, Pittsburgh.

HEAT TREATING EQUIPMENT — Air Draw
Herrington & Randall, Inc., Detroit.

HEATERS—Unit
Buffalo (N. Y.) Forge Co., 492 Broadway.

HELMETS AND HANDSHIELDS—Welding
Willson Products, Inc., Reading, Pa.

HOBS
Barber-Colman Co., Rockford, Ill.

HOISTS—Air
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Detroit (Mich.) Hoist & Mach. Co.
Hanna Engineering Works, 1761 Elston Ave., Chicago.
Ingersoll-Rand Co., 11 Broadway, N. Y. C.
Northern Engineering Works, Detroit.

HOISTS—Chain
Reading (Pa.) Chain & Block Corp.
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric
American Engineering Co., Philadelphia.
Detroit (Mich.) Hoist & Mach. Co.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Harris Brothers, Inc., Philadelphia.
Northern Engineering Works, Detroit, Mich.
Philadelphia (Pa.) Gear Works.
Reading (Pa.) Chain & Block Corp.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

HOISTS—Electric Traveling
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

GOSS and DE LEEUW
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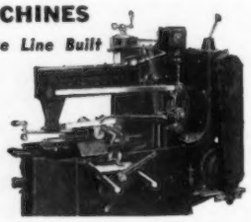
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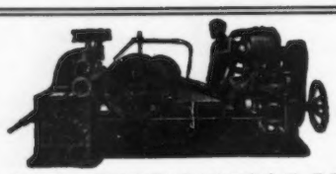
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Bulletin on new Insert Chaser Type of Die Head.
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See our Advt., page 198, Oct. 13, Iron Age.
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FEEDS
AUTOMATIC EQUIPMENT
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HUDSON, N. Y.

PRODUCTS INDEX

Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

HOISTS—Monorail
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOSE—Air, Oil, Steam and Water
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

HOSE—Flexible Metallic
American Brass Co., The, Waterbury, Conn.
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

HOSE—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

HYDRANTS—Fire
Wood, R. D., & Co., Philadelphia.

HYDRAULIC FEEDS
Vickers, Inc., 1420 Oakman Blvd., Detroit.

HYDRAULIC MACHINERY
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Chambersburg (Pa.) Engineering Co.
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulik Gmbh, Duisburg, Germany.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
Wood, R. D., & Co., Philadelphia.

INGOT MOLDS
Shenango Furnace Co., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.
Snyder, W. P., & Co., Pittsburgh.

INGOTS—Aluminum
Aluminum Co. of America, Pittsburgh.

INGOTS—Phosphor Bronze
Phosphor Bronze Smelting Co., The, Phila.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.

INSTRUMENTS—Electric
General Electric Co., Schenectady, N. Y.
Weston Electrical Instrument Corp., Newark, N. J.

INSTRUMENTS—Recording
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

INSULATION
Johns-Manville Corp., 22 East 40th St., New York City.

IRON—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

IRON WORKERS—Universal
Buffalo (N. Y.) Forge Co., 492 Broadway.

JIGS, FIXTURES, DIES, etc. (See Dies, Jigs, Fixtures, etc.)

KEYS—Riveted
Western Wire Prods. Co., St. Louis, Mo.

KEYSEATING MACHINES
Baker Bros., Inc., Toledo, Ohio.
Davis Keyseater Co., 400 Exchange St., Rochester, N. Y.

LACING—Belt, Rawhide or Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LAMPS—Filament
General Electric Co., Cleveland.

LAMPS—Mercury Vapor
General Electric Vapor Lamp Co., Hoboken, N. J.

LAPPING MACHINES
Cincinnati (Ohio) Grinders Incorporated.

LATHE ATTACHMENTS
Hendey Machine Co., Torrington, Conn.

LATHES—Automatic
Baird Mch. Co., The, Brideport, Conn.
Bullard Co., The, Bridgeport, Conn.
Goss & De Leeuw Mch. Co., New Britain, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cincinnatti.
Monarch Mch. Tool Co., The, Sidney, O.
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Automatic Vertical
Baird Mch. Co., The, Bridgeport, Conn.
Bullard Co., The, Bridgeport, Conn.

LATHES—Bench
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

LATHES—Brass
Warner & Swasey Co., The, Cleveland.

LATHES—Chucking
Jones & Lamson Mch. Co., Springfield, Vt.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., The, Cleveland.

LATHES—Contour Turning
Monarch Mch. Tool Co., The, Sidney, O.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Engine
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Lathe & Tool Co.
Hendey Machine Co., Torrington, Conn.
Hill-Clarke Henry Co., 647 W. Washington Blvd., Chicago.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

LATHES—High Speed
Hendey Machine Co., Torrington, Conn.

LATHES—Roll
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

LATHES — Second-Hand. (See Clearing House Section)

LATHES—Toolroom
Cincinnati (Ohio) Lathe & Tool Co.
LeBlond, R. K., Machine Tool Co., Cincinnati, Ohio.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

LATHES—Turret
Bardons & Oliver, Cleveland.
Bullard Co., The, Bridgeport, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland Sales & Machine Co., Indianapolis, Ind.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., The, Cleveland.

LATHES, Turret, Vertical
Bullard Co., The, Bridgeport, Conn.

LAYOUT FLUID
Dayton Rogers Mfg. Co., Minneapolis, Minn.

LEAD LININGS
National Lead Co., 111 Bdway., N. Y. C.

LEAD—In Oil
National Lead Co., 111 Bdway., N. Y. C.

LEAD—Tellurium
National Lead Co., 111 Bdway., N. Y. C.

LEATHER—Cup
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LEGGINS—Safety
Safety Equipment Service Co., Cleveland.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
McKay Machine Co., The, Youngstown, Ohio.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Wean Engineering Co., Inc., The, Warren, O.

LOCOMOTIVES—Electric
Atlas Car & Mfg. Co., The, Cleveland.
Davenport (Iowa) Locomotive Works, a Division of Davenport Besler Corp.

LOCOMOTIVES—Gas-Electric
Davenport (Iowa) Locomotive Works, a Division of Davenport Besler Corp.

LOCOMOTIVES—Gasoline
Plymouth (Ohio) Locomotive Wks.

LOCOMOTIVES—Industrial
Davenport (Iowa) Locomotive Works, a Division of Davenport Besler Corp.
Plymouth (Ohio) Locomotive Wks.

LOCOMOTIVES—Steam
Iron & Steel Products, Inc., Chicago.

LOCOMOTIVES—Storage Battery
Atlas Car & Mfg. Co., The, Cleveland.

LUBRICANTS—Crusher & Grinding
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Gear
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LURRICANTS—High Pressure & Temperature
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.

PRODUCTS INDEX

Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mine Cars
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mining Machines
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Railroad
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Roll Neck—Anti-Friction & Plain
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 E. 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Tipple & Cleaning
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco; Shell Bldg., St. Louis, and 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICATING SYSTEMS
Farval Corp., The, Cleveland.

MACHINE GUARD MATERIALS
Erdle Perforating Co., Rochester, N. Y.

MACHINE WORK
Dodge Mfg. Co., Mishawaka, Ind.
General Machine Works, York, Pa.
Nelson Bros. & Strom, Racine, Wis.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

MACHINERY DEALERS—Second-Hand (See Clearing House Section)

MACHINISTS' SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.

MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Perth Amboy, N. J.

MAGNESIUM
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Electric Controller & Mfg. Co., The, Cleve.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.

MAGNETS — Separating—See Separators—Magnetic

MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

MANDRELS—Expanding
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

MANHOLE FITTINGS AND SADDLES
Worth Steel Co., Claymont, Del.

MANIFOLDS—Oxygen & Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

MARKING MACHINES
Noble & Westbrook Mfg. Co., The, East Hartford, Conn.

METAL NAME PLATES
Grammes, L. F., & Sons, Inc., Allentown, Pa.

METAL SPECIALTIES
Crosby Co., The, Buffalo, N. Y.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Torrington (Conn.) Company.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.
York (Pa.) Corrugating Co.

METERS—Electric Welding
Lincoln Electric Co., The, Cleveland.

METERS—Flow
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

METERS—Gas or Air
Roots-Connersville Blower Corp., Connersville, Ind.

METERS—Water & Oil
Worthington Pump & Machinery Corp., Harrison, N. J.

MICROMETERS—Dial for Sheet Metal
Haines Gauge Co., The, Phila., Pa.

MILLING MACHINES—Automatic
Cincinnati (Ohio) Milling Mch. Co., The.
Potter & Johnston Machine Co., Pawtucket, R. I.

MILLING MACHINES—Horizontal
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Potter & Johnston Machine Co., Pawtucket, R. I.

MILLING MACHINES—Planer Type
Cincinnati (Ohio) Planer Co.

MILLING MACHINES — Second-Hand. (See Clearing House Section)

MILLING MACHINES—Vertical
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Potter & Johnston Machine Co., Pawtucket, R. I.

MOLDING MACHINES
Tabor Mfg. Co., Phila., Pa.

MONEL METAL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

MONORAIL SYSTEMS—Hand & Electric
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Chicago (Ill.) Electric Co.
Fairbanks, Morse & Co., Chicago.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Ptgh.

MOTORS—Electric, Second-Hand. (See Clearing House Section)

NAILS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Hassall, John, Inc., Clay & Oakland Sts., Bklyn., N. Y.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Youngstown (Ohio) Sheet & Tube Co., The.

NIBBLING MACHINES
Gray Machine Co., Philadelphia.

NICKEL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

NICKEL-PLATING
Bright Nickel Corp., Detroit, Mich.

NITROGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

NOZZLES—Sand Blasting
Norton Co., Worcester, Mass.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

NUT MACHINERY — Automatic Cold Pressed
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

NUTS—Castellated
National Acme Co., The, Cleveland.

NUTS—Lock
Standard Pressed Steel Co., Jenkintown, Pa.

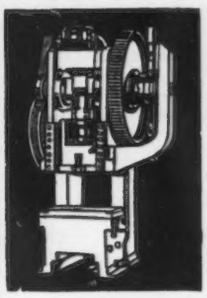
NUTS—Machine Screw
Progressive Mfg. Co., Torrington, Conn.

NUTS—Semi-Finished
Cleveland (Ohio) Cap Screw Co., The.

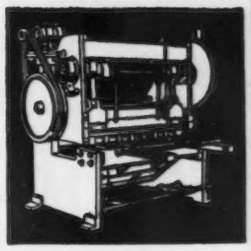
NUTS—Special
Tinnerman Stove & Range Co., Speed Nut Div., Cleveland.

OIL & GREASE SEALS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

CHICAGO



BRAKES
SHEARS
PRESSES
ALL TYPES
AND SIZES



STEEL CONSTRUCTION

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NEW YORK CITY — Wm. H. Leonori & Co., Inc., 30 Howard St.
PHILADELPHIA—C. B. Tippett, 4308 North Broad St.
CHICAGO—Central Steel & Wire Co., 4545 South Western Blvd.
DETROIT — E. R. Wegener, 3050 East Grand Blvd.
BUFFALO — J. J. Lambert, 323 Huntington Ave.
DAYTON—Central Steel & Wire Co., 1095 East Monument Ave.
SAN FRANCISCO — Charles L. Lewis, 703 Market St.

GRIFFIN MFG. CO. ERIE, PENNA.

WETHERELL BROS. CO.
251 Albany St., Cambridge, Mass.
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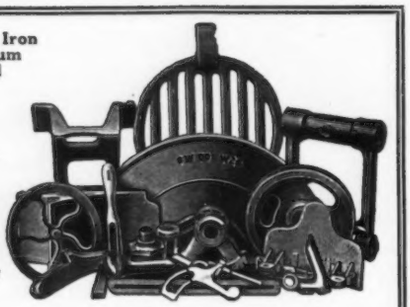

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PRODUCTS INDEX

OIL RETAINERS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

OIL STONES
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

OILS—Cutting
Penola, Inc., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago, Ill.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Fuel
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Standard Oil Co. (Indiana), Chicago, Ill.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Lubricating
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Standard Oil Co. of New Jersey, 26 Broadway, N. Y. C.
Texas Company, The, 135 East 42nd St, N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Soluble—See Oils—Cutting

ORES—Iron
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Pickands Mather & Co., Cleveland.
Shenango Furnace Co., Pittsburgh.
Snyder, W. P., & Co., Pittsburgh.

OVENS—Coke and By-Product Recovery
Koppers Co., Pittsburgh.

OVENS—Core and Mold
Herrington & Randall, Inc., Detroit.
Holcroft & Co., Detroit.
Monarch Engineering & Mfg. Co., The, Baltimore, Md.

OVENS—Cross Regenerative
Koppers Co., Pittsburgh.

OVENS—Enameling and Japanning
Carborundum Co., The, Perth Amboy, N. J.
Herrington & Randall, Inc., Detroit.

OXY-ACETYLENE — Shape-Cutting Machines
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

OXYGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

PACKING—Felt
American Felt Co., 315 Fourth Ave., N. Y. C.

PACKING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Locomotive Cylirder
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PACKING—Metallic
Garlock Packing Co., The, Palmyra, N.Y.

PACKING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

PACKING—Sheet, Asbestos or Rubber
Garlock Packing Co., The, Palmyra, N.Y.
Johns-Manville Corp., 22 East 40th St., New York City.

PAINT
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
National Lead Co., 111 Bdway., N. Y. C

PARALLELS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

PERFORATED METAL
Chicago Perforating Co., 2440 W 24th Place, Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

PHOSPHOR—Conner
Phosphor Bronze Smelting Co., The, Phila.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa

PICKLING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.

PICKLING TANK LININGS
Ceilcote Co., The, Cleveland.
Keagler Brick Co., Steubenville, Ohio.
National Lead Co., 111 Bdway., N. Y. C.

PICKLING TANK STEAM JETS
Durion Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

PIG IRON
Bethlehem (Pa.) Steel Co.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Hanna Furnace Corp., The, Detroit, Mich.
Jackson (Ohio) Iron & Steel Co., The.
Pickands Mather & Co., Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Shenango Furnace Co., Pittsburgh.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

PILING—Steel Pipe
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PILING—Steel Sheet
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

PILLOW BLOCKS
Dodge Mfg. Co., Mishawaka, Ind.

PINIONS—Rolling Mill
Mesta Mch. Co., Pittsburgh.

PINIONS—Wire and Rod
Rathbone, A. R. & J., Palmer, Mass.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland.

PIPE—Cast Iron, B. & S. and Flanged
Wood, R. D., & Co., Philadelphia.

PIPE—Hammer Welded
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PIPE—Lead
National Lead Co., 111 Bdway., N. Y. C.

PIPE—Lead Lined
National Lead Co., 111 Bdway., N. Y. C.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc. Berry and N. 13th St., Bklyn., N. Y.
Greenpoint Iron & Pipe Co., Inc., Stagg & Bogart Sts., Bklyn., N. Y.

PIPE—Seamless Brass or Copper
American Brass Co., The, Waterbury, Conn.

PIPE—Spiral Welded
American Rolling Mill Co., Middletown, O.
Crane Co., Chicago.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.

PIPE—Welded, Electric
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.

PIPE COVERING—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

PIPE CUTTERS
Ridge Tool Co., Elyria, Ohio.

PIPE FITTINGS
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.

PIPE THREADERS
Ridge Tool Co., Elyria, Ohio.

PIPE THREADING & CUTTING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Cox & Sons Co., The, Bridgeton, N. J.
Jarecki Mfg. Co., Erie, Pa.
Landis, Mach. Co., Inc., Waynesboro, Pa.
Merrell Mfg. Co., Toledo.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PISTON RINGS
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PLANERS
Cincinnati (Ohio) Planer Co.

PLANERS—Rotary
Esnen-Lucas Mch. Wks., Philadelphia.

PLANING MACHINES — Second Hand. (See Clearing House Section)

PLASTICS—Laminated
Bakelite Corp., 247 Park Ave., N. Y. C.

PLASTICS—Molded
Bakelite Corp., 247 Park Ave., N. Y. C.

PLASTICS—Synthetic
Bakelite Corp., 247 Park Ave., N. Y. C.

PLATER'S CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.

PLATES—Floor or Cellar Door
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.

PRODUCTS INDEX

PLATES—Iron or Steel
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Ryerson, Joseph T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Worth Steel Co., Claymont, Del.
Youngstown (Ohio) Sheet & Tube Co., The.

PLATFORMS—Skid
Standard Pressed Steel Co., Jenkintown Pa.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Mich.

POLISHING & BUFFING MACHINES—Automatic
Packer Machine Co., The, Meriden, Conn.

POLISHING MACHINES
Packer Machine Co., The, Meriden, Conn.

POLISHING MACHINES—Bar
Medart Co., The, St. Louis, Mo.

POLISHING MACHINES—Belt
Production Machine Co., Greenfield, Mass.

POWER TRANSMITTING MACHINERY
Dodge Mfg. Co., Mishawaka, Ind.

POWER UNITS—Rotary
Cushman Chuck Co., Hartford, Conn.
New Departure Div., General Motors Corp., Bristol, Conn.

POWER UNITS—Straight Line
Cushman Chuck Co., Hartford, Conn.

PRESS BRAKES — See Brakes — Metal Forming

PRESS FEEDS—Automatic
Littell, F. J., Mch. Co., Chicago.

PRESSED METAL PARTS
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

PRESSED STEEL PARTS
Crosby Co., The, Buffalo, N. Y.
Lansing (Mich.) Stamping Co., So. Penn Ave.
Parish Pressed Steel Co., Reading, Pa.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
York (Pa.) Corrugating Co.

PRESSES—Automatic
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Mfg. Co., The, Hartford, Conn.
Niagara Mch. & Tool Wks., Buffalo, N. Y.
V & O Press Co., Hudson, N. Y.

PRESSES—Baling
Galland-Henning Mfg. Co., Milwaukee.

PRESSES—Baling, Hydraulic
Baldwin-Southwark Corp., Southwark Div. Philadelphia.
Galland-Henning Mfg. Co., Milwaukee.

PRESSES—Coining
Ferracute Machine Co., Bridgeton, N. J.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Drop—See Hammers—Drop

PRESSES—Foot
Baird Mch. Co., The, Bridgeport, Conn.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

PRESSES—Forging
Ajax Mfg. Co., The, Euclid, Ohio.
Chambersburg (Pa.) Engineering Co.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulik Gmbh, Duisburg, Germany.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.

PRESSES—Forming and Bending
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mch. & Tool Wks., Buffalo, N. Y.
U. S. Tool Co., Inc., Ampere, N. J.

PRESSES—Friction Screw
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Chambersburg (Pa.) Engineering Co.
Farquhar, A. B., Co., Ltd., York, Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hannifin Mfg. Co., Chicago.
Hydraulik Gmbh, Duisburg, Germany.
Lake Erie Engineering Corp., 68 Kenmore Sts., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Oilgear Co., The, 1311 W. Bruce, Milwaukee.
Wood, R. D., & Co., Philadelphia.

PRESSES—Power
Baird Mch. Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago, Ill.
Farrel-Birmingham Co., Inc., Ansonia Conn.
Ferracute Machine Co., Bridgeton, New Jersey.
Hyman, Joseph, & Sons, Phila.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Wks., Buffalo, N.Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
U. S. Tool Co., Inc., Ampere, N. J.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Trimming
Chambersburg (Pa.) Engineering Co.
Erie (Pa.) Foundry Co.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PULLEYS—Friction Clutch
Dodge Mfg. Co., Mishawaka, Ind.

PULLEYS—Iron, Solid & Split
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.
Dodge Mfg. Co., Mishawaka, Ind.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.

PULLEYS—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

PULVERIZERS
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.
Whiting Corp., Harvey, Ill.

PUMPS—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

PUMPS—Boiler Feed
Ingersoll-Rand Co. (Cameron), 11 Broadway, N. Y. C.

PUMPS—Centrifugal
Fairbanks, Morse & Co., Chicago.
Ingersoll-Rand Co. (Cameron), 11 Broadway, N. Y. C.
Ruthman Machinery Co., Cincinnati.
Tomkins-Johnson Co., The, Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Coolant
Roper, George D., Corp., Rockford, Ill.
Ruthman Machinery Co., Cincinnati.

PUMPS—Electric
Fairbanks, Morse & Co., Chicago.
Roper, George D., Corp., Rockford, Ill.

PUMPS—Hydraulic
Fairbanks, Morse & Co., Chicago.
Lake Erie Engineering Corp., 68 Kenmore Sts., Buffalo, N. Y.
Roper, George D., Corp., Rockford, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Power
Fairbanks, Morse & Co., Chicago.
Roper, George D., Corp., Rockford, Ill.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Power Transmission
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Roper, George D., Corp., Rockford, Ill.
Vickers, Inc., 1420 Oakman Blvd., Detroit.

PUMPS—Rotary
Vickers, Inc., 1420 Oakman Blvd., Detroit.

PUMPS—Rotary Positive, Centrifugal & Turbine
Crane Co., Chicago.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Steam
Fairbanks, Morse & Co., Chicago.
Ingersoll-Rand Co. (Cameron), 11 Broadway, N. Y. C.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS—Vacuum
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES & DIES
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

PUNCHING AND SHEARING MACHINES
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 Broadway.
Chambersburg (Pa.) Engineering Co.
Cincinnati (Ohio) Shaper Co., The.
Excelsior Tool & Mach. Co., E. St. Louis, Ill.
Niagara Machine & Tools Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Thomas Mach. Mfg. Co., Pittsburgh.

PYROMETERS—Indicating
Hoskins Mfg. Co., Detroit, Mich.
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Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

RAILS—Relaying
Hyman-Michaels Co., Chicago.
Iron & Steel Products, Inc., Chicago.
Sherwood, E. C., 50 Church St., N. Y. C.

RAILWAY EQUIPMENT & SUPPLIES
Fairbanks, Morse & Co., Chicago.
Iron & Steel Products, Inc., Chicago.

REAMING MACHINES
Blanchard Machine Co., The, Cambridge, Mass.

REAMERS
Cleveland (Ohio) Twist Drill Co., The.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

REAMERS—Expansion
Apex Machine & Tool Co., The, Dayton, Ohio.
Barber-Colman Co., Rockford, Ill.

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Littell, F. J., Mch. Co., Chicago.

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Cleveland (Ohio) Quarries Co., The.
Illinois Clay Products Co., Joliet, Ill.

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Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

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Pittsburgh (Pa.) Steel Co.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

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Willson Products, Inc., Reading, Pa.

RIDDLES—Foundry
Ludlow-Saylor Wire Co., St. Louis, Mo.

RINGS—Iron or Steel
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.
Standard Steel Wks. Co., Burnham, Pa.

RINGS—Welded
American Welding & Mfg. Co., Warren, Ohio.
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

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Waterbury (Conn.) Farrel Foundry & Machine Co., The.

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RIVETING MACHINES
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Hannifin Mfg. Co., Chicago.
Shuster, F. B., Co., The, New Haven, Ct.
Tomkins-Johnson Co., The, Jackson, Mich.

RIVETS
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Clark Bros. Bolt Co., Milldale, Conn.
Hassall, John, Inc., Clay & Oakland Sts., Bklyn., N. Y.
Progressive Mfg. Co., Torrington, Conn.

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Aluminum Co. of America, Pittsburgh.

RODS—Brass
American Brass Co., The, Waterbury, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

RODS—Connecting
Kropp Forge Co., Chicago, Ill.

RODS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave. Midland, Mich.

RODS—Nickel Silver
American Brass Co., The, Waterbury, Conn.

RODS—Phosphor Bronze
American Brass Co., The, Waterbury, Conn
Phosphor Bronze Smelting Co., The, Phila.

RODS—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Pittsburgh (Pa.) Steel Co.
Titan Metal Mfg. Co., Bellefonte, Pa.

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American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.
Youngstown (Ohio) Sheet & Tube Co., The.

ROLL HEATERS
Kemp, C. M., Mfg. Co., The, Baltimore, Md.

ROLLING MACHINERY—Cold Rolling
Cold Metal Process Co., The, Youngstown, Ohio.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLING MACHINERY—Sheet Metal
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.

ROLLING MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Cold Metal Process Co., The, Youngstown, Ohio.
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Farrel-Birmingham Co., Inc., Ansonia, Ct.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
McKay Machine Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

ROLLING MILLS—Copper Rod & Sheet
Torrington (Conn.) Mfg. Co., The.

ROLLS—Alloy Steel
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.

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Bertsch & Co., Cambridge City, Ind.
Lake Erie Engineering Corp., 68 Kenmore Sta., Buffalo, N. Y.
McKay Machine Co., The, Youngstown, Ohio.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

ROLLS—Rubber Covered
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

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Aetna-Standard Engineering Co., The Youngstown, Ohio.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

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Bethlehem (Pa.) Steel Co.
Midvale Co., The Nicetown, Phila., Pa.

ROOFING—Coal Tar Pitch
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

ROOFING—Special Copper Bearing Steel
Superior Sheet Steel Co., Canton, Ohio.

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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Johns-Manville Corp., 22 East 40th St., New York City.
Jones & Laughlin Steel Corp., Pittsburgh.
Weirton (W. Va.) Steel Co.

ROOFING AND SIDING—Iron and Steel
Inland Steel Co., Chicago.

ROOFING & SIDING—(Zinc)—Corrugated & Plain
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

RUBBER LININGS
Goodrich, B. F., Co., The, Akron, Ohio.

RUBBER MOLDED PARTS
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.

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Morton Salt Co., Chicago, Ill.

SAND BLAST STEEL SHOT
Harrison Abrasive Corp., Manchester, N. H.
Pittsburgh (Pa.) Crushed Steel Co.

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Espen-Lucas Mch. Works, Phila.
Tannewitz Works, The, Grand Rapids, Mich.

SAWING MACHINES—Metal-Band
Continental Machine Specialties, Inc., Minneapolis, Minn.
Tannewitz Works, The, Grand Rapids, Mich.

PRODUCTS INDEX

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.
Tannewitz Works, The, Grand Rapids Mich.

SAWS—Circular, Rip & Cutoff
Atkins, E. C., & Co., Indianapolis.

SAWS—Friction
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Hack Saw Blades
Atkins, E. C., & Co., Indianapolis.
Millers Falls Co., Greenfield, Mass.

SAWS—Hot Metal
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Inserted Tooth, Cold
Disston, Henry, & Sons, Inc., Philadelphia.
Tabor Mfg. Co., Philadelphia.

SAWS—Milling
Atkins, E. C., & Co., Indianapolis.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Portable Electric
Black & Decker Mfg. Co., The, Towson, Md.

SAWS—Screw Slotting
Barber-Colman Co., Rockford, Ill.

SCALES
Fairbanks, Morse & Co., Chicago.
Streeter-Amet Co., Chicago.

SCRAP BUNDLING MACHINES—Metal
Cox & Sons Co., The, Bridgeton, N. J.

SCREENS—Perforated Metal
Chicago Perforating Co., 2440 W. 24th Place, Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

SCREENS—Woven Wire
Ludlow-Saylor Wire Co., St. Louis, Mo.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SCREW DRIVER BITS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW DRIVERS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

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Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Commonwealth Brass Corp., Detroit.
Eastern Mch. Screw Corp., New Haven.
National Acme Co., The, Cleveland.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
R & L Tools, Philadelphia.

SCREW MACHINERY—Automatic
Brown & Sharpe Mfg. Co., Providence R. I.
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW MACHINERY—Hand
Warner & Swasey Co., The, Cleveland.

SCREW MACHINERY—Multiple Spindle
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW PLATES
Greenfield (Mass.) Tap & Die Corp.

SCREW STOCK
Jones & Laughlin Steel Corp., Pittsburgh.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SCREWS—Cap
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
National Acme Co., The, Cleveland
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland.

SCREWS—Machine
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., The, Torrington, Ct.

SCREWS—Machine, Recessed Head
American Screw Co., Providence, R. I.

SCREWS—Safety Set
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Set
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS—Sheet Metal, Recessed Head
American Screw Co., Providence, R. I.

SCREWS, Socket, Head, Cap
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Wood, Recessed Head
American Screw Co., Providence, R. I.

SCRIBERS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

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SCYTHE STONES AND WHETSTONES
Carborundum Co., The, Niagara Falls, N.Y.

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Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

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La Salle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAFTING—Forged
Bay City Forge Co., Erie, Pa.

SHAFTING—Steel
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAFTING—Turned and Ground
Jones & Laughlin Steel Corp., Pittsburgh.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAPERS
Cincinnati (Ohio) Shaper Co., The.
Hendey Machine Co., Torrington, Conn.

SHAPERS—Vertical
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

SHAPES—Cold Drawn
Jones & Laughlin Steel Corp., Pittsburgh.
La Salle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAPES—Wire
American Spring & Mfg. Corp., Holly, Mich.
Cuyahoga Spring Co., The, Cleveland.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
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Heppenstall Co., Pittsburgh.

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Canton Fdry. & Mch. Co., Cleveland.

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Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y

SHEARING MACHINES—Bar
Buffalo (N. Y.) Forge Co., 492 Broadway.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES—Beam and Channel
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES—Billet
Morgan Engineering Co., The, Alliance, O.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Pitgh.

SHEARING MACHINES — Continuous Sheet & Pack
Aetna-Standard Engineering Co., The, Youngstown, Ohio.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Pitgh.

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Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Squaring
Cincinnati (Ohio) Shaper Co., The.
Dreis & Krump Co., Chicago.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

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Waterbury (Conn.) Farrel Foundry & Machine Co., The.

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Aluminum Co. of America, Pittsburgh.

SHEETS—Auto Body
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Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
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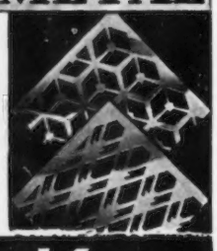

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Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Scullin Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.
Worth Steel Co., Claymont, Del.

SHEETS—Brass, Bronze, Copper, Nickel, Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Phila.

SHEETS—Chrome
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary); Pittsburgh & Chicago.

SHEETS—Chrome Nickel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Cold Rolled
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Copper Alloy
American Brass Co., The Waterbury, Conn.

SHEETS—Copper Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.

SHEETS—Electrical
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Enameling
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.

SHEETS—For Drawing and Stamping
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Worth Steel Co., Claymont, Del.

SHEETS—Full Finished
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Galvanized, Flat and Corrugated
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Lead
National Lead Co., 111 Bdway., N. Y. C.

SHEETS—Long Terne
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

SHEETS—Metal Furniture
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Pickled
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Tin Mill Black
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.

SHEETS—Zinc
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

SHOVELS—Mounted—See Cranes

SHUTTERS—Steel & Wood Bi-Folding
Kinnear Mfg. Co., Columbus, Ohio.

SILICO—MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SILICON METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SINE BARS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

SLINGS—Wire Rope
Roebling's, John A., Sons Co., Trenton, N. J.

SLITTERS—Gang
McKay Machine Co., The, Youngstown, Ohio.

SLOTTING MACHINES
Nazel Engineering & Machine Works, Philadelphia.

SOAKING PITS
Amsler-Morton Co., Pittsburgh.

SOLDER—Flux-Filled
Gardiner Metal Co., 4884 S. Campbell Ave., Chicago.

SPACING TABLES—Punching & Shearing
Thomas Mach. Mfg. Co., Pittsburgh.

SPECIAL MACHINERY
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Bullard Co., The, Bridgeport, Conn.
Dodge Mfg. Co., Mishawaka, Ind.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Morgan Engineering Co., The, Alliance, O.
Nelson Bros. & Strom, Racine, Wis.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Wood, R. D., & Co., Philadelphia.

SPECIALTIES—Rubber Covered & Lined
Goodrich, B. F., Co., The, Akron, Ohio.

SPEED REDUCERS
Cleveland (Ohio) Worm & Gear Co.
Philadelphia (Pa.) Gear Works.
Poole Foundry & Mch. Co., Baltimore, Md.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SPIKES—Screw
Oliver Iron & Steel Corp., Pittsburgh.

SPIKES—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

SPLICE BARS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SPRING MAKING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington (Conn.) Mfg. Co., The.

SPRINGS—Car
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.

SPRINGS—Extension, Compression, Torsion or Flat
Amer. Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Cuyahoga Spring Co., The, Cleveland.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

SPROCKETS
Baldwin-Duckworth Chain Corp., Springfield, Mass.
Howe Mfg. Co., The, Cleveland.
Whitney Chain & Mfg. Co., Hartford, Ct.

STAMPINGS OR DRAWINGS—Metal
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.

PRODUCTS INDEX

Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Crosby Co., The, Buffalo, N. Y.
Dayton Rogers Mfg. Co., Minneapolis, Minn.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Hubbard, M. D., Spring Co., 750 Central Ave., Pontiac, Mich.
Lansing (Mich.) Stamping Co., So. Penn. Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Brooklyn, N. Y.
Parish Pressed Steel Co., Reading, Pa.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.
Torrington (Conn.) Company
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Wagner Specialty Co., Burlington, Wis.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.
York (Pa.) Corrugating Co.

STAMPS—Steel Alphabets and Figures
Noble & Westbrook Mfg. Co., The, East Hartfrod, Ct.

STAPLES—Wire
Wickwire Brothers, Cortland, N. Y.

STEEL—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Harrisburg (Pa.) Steel Corp.
Ingersoll Steel & Disc Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co. The.

STEEL—Alloy, Cold Drawn
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Bright Finished
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

STEEL—Carbon
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Ingersoll Steel & Disc Co., Chicago.

STEEL—Case Hardening
Monarch Steel Co., Indianapolis, Ind.

STEEL—Chrome Nickel Silver
Ingersoll Steel & Disc Co., Chicago.

STEEL—Cobalt
Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn
Jones & Laughlin Steel Corp., Pittsburgh.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., Indianapolis, Ind.
Rathbone, A. B. & J., Palmer, Mass.
Ryerson, Joseph T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

STEEL—Cold Rolled Strips
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Cold Metal Process Co., The, Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Sons, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Steel & Tubes, Inc., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Thomas Steel Co., The, Warren, Ohio.
Weirton (W. Va.) Steel Co.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Cold Rolled Strips, Electro Copper Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Electro-Galvanized
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Electro Tin Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strips, Stainless
Cold Metal Process Co., The, Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.

STEEL—Corrosion Resisting
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Superior Steel Corp., Carnegie, Pa.

STEEL—Crucible
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL—Die
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Disston, Henry, & Sons, Inc., Philadelphia.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Drill
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL—Electric
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Disston, Henry, & Sons, Inc., Philadelphia.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—High Speed
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland (Ohio) Twist Drill Co., The.
Ingersoll Steel & Disc Co., Chicago.
Latrobe (Pa.) Electric Steel Co.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hot Rolled Strips
Bethlehem (Pa.) Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn., Bridgeport, Conn.
Steel & Tubes, Inc., Cleveland.
Superior Steel Corp., Carnegie, Pa.
Weirton (W. Va.) Steel Co.

STEEL—Hot Rolled Strips, Electro Zinc Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Open Hearth
Pittsburgh (Pa.) Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Griffin Mfg. Co., Erie, Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

STEEL—Screw
Monarch Steel Co., Indianapolis, Ind.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

STEEL—Special Analysis
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Spring
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace, Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Gibson, Wm. D., Co., Div. of Associated Spring Corp., Chicago.
Great Lakes Steel Corp., Detroit.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL-Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Disston, Henry, & Sons, Inc., Philadelphia.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Rustless Iron & Steel Corp., Baltimore, Md.
Ryerson, Jos. T., & Sons, Inc., Chicago.

AS THE YEAR
Draws To A Close

As we look back on a year that has only two days to run we remember with pride the frequency with which so many of our old friends wrote "Hendrick" on their requisitions and purchase orders. To these old friends, our sincere thanks for their co-operation and our best wishes for a Happy and Prosperous 1939.

Of those who were not numbered among our repeat customers of 1938, we ask only an opportunity to demonstrate during 1939 the quality and craftsmanship of Hendrick Perforated Metal, Hendrick Perforated Screens, Hendrick Decorative Grills, Mitco Open Steel Flooring and other Hendrick products.

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Sixty-seven years of manufacturing perforated metals for every conceivable purpose assure satisfaction.

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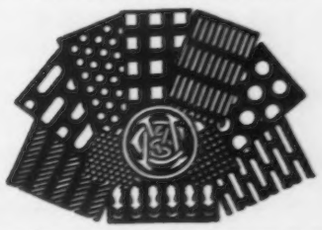

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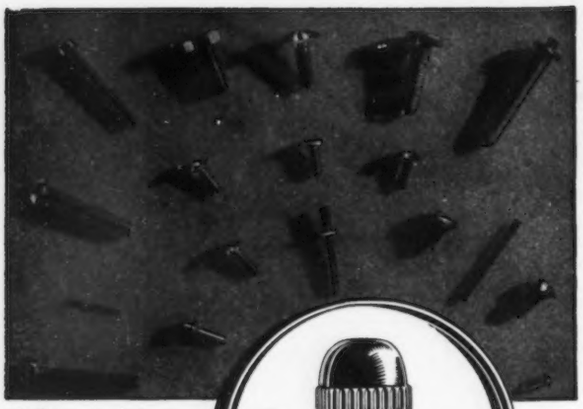

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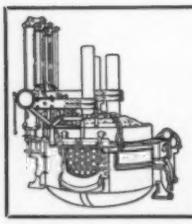

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FOR THE RAPID AND ECONOMIC PRODUCTION OF STEEL AND IRON
Pittsburgh Lectromelt Furnace Corporation
P. O. Box 1257 Pittsburgh, Pa.

PRODUCTS INDEX

Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Superior Steel Corp., Carnegie, Pa.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Stainless Clad
Ingersoll Steel & Disc Co., Chicago.

STEEL—Tool
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Darwin & Milner, Inc., Cleveland.
Disston, Henry, & Sons, Inc., Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Co., Chicago.
Jessop, Wm., & Sons, Inc., 121 Varick St., N. Y. C.
Midvale Co., The, Nicetown, Phila., Pa.
Ryerson, Jos., T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Tool, Special Shapes
Forging & Casting Corp., The, Ferndale, Mich.

STEEL PLANTS AND ROLLING MILLS
Brassert, H. A., & Co., Chicago, Ill.

STEEL ROLLS
United Engineering & Fdry. Co., Ptgh.

STOKERS
Babcock & Wilcox, The, 85 Liberty St., New York City.
Whiting Corp., Harvey, Ill.

STRAIGHT EDGES
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

STRAIGHTENING MACHINES—Bar & Tube
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Medart Co., The, St. Louis, Mo.

STRAIGHTENING MACHINES—Wire
Lewis Machine Co., The, Cleveland.
Shuster, F. B., Co., The, New Haven, Conn.

STRUCTURAL IRON AND STEEL WORK
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Bethlehem (Pa.) Steel Co.
Morgan Engineering Co., The, Alliance, O.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

STUDS
Erie (Pa.) Bolt & Nut Co.

SUB PRESSES
U. S. Tool Co., Inc., Ampere, N. J.

SUPERHEATERS
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

SWAGING MACHINES
Torrington (Conn.) Company.

SWITCHES—Electric
Westinghouse Elec. & Mfg. Co., East Ptgh.

TANK LININGS
Cellcote Co., The, Cleveland.
Nukem Prods., Corp., 68 Niagara St., Buffalo, N. Y.

TANK LININGS—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

TANKS—Compressed Air, Gas, Oil and Water
Scaife, Wm. B., & Sons Co., Ptgh.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

TANKS—Iron and Steel
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Munroe R., & Sons Mfg. Corp., Pittsburgh.
Scaife, Wm. B., & Sons, Co., Ptgh.

TANKS—Pickling
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Cleveland (Ohio) Quarries Co., The.
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

TANKS—Rubber Lined
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Goodrich, B. F., Co., The, Akron, Ohio.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., The, 2 Townsend St., Passaic, N. J.

TANKS—Welded
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Scaife, Wm. B., & Sons Co., Pittsburgh.

TAPPING MACHINES
Acme Machinery Co., The, Cleveland.
Baker Bros. Inc., Toledo, Ohio.
Waterbury (Conn.) Farrel Fdry. & Mch. Co.

TAPS—Collapsing
Geometric Tool Co., The, New Haven, Conn.
Landis Mach. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

TAPS AND DIES
Greenfield (Mass.) Tap & Die Corp.
Landis Mch. Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

TEES—See Angles, Beams, Channels and Tees

TERNE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

TESTING MACHINES—Ductility
Olsen, Tinius, Testing Machine Co., Philadelphia.

TESTING MACHINES—Hardness
Olsen, Tinius, Testing Machine Co., Philadelphia.
Shore Instrument & Mfg. Co., The, Jamaica, L. I., N. Y.

TESTING MACHINES—Impact
Olsen, Tinius, Testing Machine Co., Philadelphia.

TESTING MACHINES—Materials
Baldwin-Southwark Corp., Southwark Div., Phila.
Olsen, Tinius, Testing Machine Co., Philadelphia.

TESTING MACHINES—Spring
Olsen, Tinius, Testing Machine Co., Philadelphia.

TESTING MACHINES—Tensile
Olsen, Tinius, Testing Machine Co., Philadelphia.

TESTING MACHINES—Torsion
Olsen, Tinius, Testing Machine Co., Philadelphia.

TESTING MACHINES—Universal
Olsen, Tinius, Testing Machine Co., Philadelphia.

THERMOMETERS
Weston Electrical Instrument Corp., Newark, N. J.

THERMOMETERS—Recording
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

THREAD CUTTING TOOLS—See Dies, Taps

THREAD ROLLING MACHINES
Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

THREADING MACHINES
Acme Machinery Co., The, Cleveland.
Eastern Mcsh. Screw Corp., New Haven, Conn.
Geometric Tool Co., The, New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.

THREADING MACHINES—Automatic
Landis Mch. Co., Inc., Waynesboro, Pa.

TIE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Weirton (W. Va.) Steel Co.

TIN PLATE
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Wean Engineering Co., Inc., The, Warren, Ohio.

TINNING EQUIPMENT—Sheets
Wean Engineering Co., Inc., The, Warren, Ohio.

TONGS—Automatic
Heppenstall Co., Pittsburgh.

TOOL HOLDERS
Armstrong Bros. Tool Co., Chicago.

TOOLS—Lathe
Armstrong Bros. Tool Co., Chicago.

TOOLS—Metal Cutting
Michigan Tool Co., Detroit, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
R & L Tools, Philadelphia.

TOOLS—Turning for Automatics
R & L Tools, Philadelphia.

TORCHES—Brazing, Cutting and Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

TRACTORS AND TRAILERS — See Trucks, Tractors and Trailers—Industrial

TRAILERS—Industrial—See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

TRAMWAYS—Wire Rope
Leschen, A., & Sons Rope Co., St. Louis, Mo.

PRODUCTS INDEX

TRANSMISSIONS—Hydraulic
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Vickers, Inc., 1420 Oakman Blvd., Detroit.

TRANSMISSIONS—Variable Speed
Reeves Pulley Co., Columbus, Indiana.

TRAPS—Steam
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

TREADS—Safety
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.
Norton Co., Worcester, Mass.

TROLLEYS
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Hanna Engineering Works, 1761 Elston Ave., Chicago.

TRUCKS—Dump (Industrial)
Towmotor, Inc., Cleveland.

TRUCKS—Elevating (Power)
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.
Towmotor, Inc., Cleveland.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Lift (Hand & Foot)
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Scoop (Industrial)
Towmotor, Inc., Cleveland.

TRUCKS, TRACTORS AND TRAILERS—Industrial
Atlas Car & Mfg. Co., The, Cleveland.
Baker-Raulang Co., The, 2175 W. 25 St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.
Towmotor, Inc., Cleveland.
Yale & Towne Mfg. Co., The, Phila., Div., Phila., Pa.

TUBE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

TUBE MILL MACHINERY—Welded
McKay Machine Co., The, Youngstown, Ohio.

TUBES—Boiler
Bissett Steel Co., The, Cleveland.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Steel & Tubes, Inc., Cleveland.

TUBES—Copper Alloy
American Brass Co., The, Waterbury, Conn.

TUBES—High Carbon
Steel & Tubes, Inc., Cleveland.

TUBES—Nickel Silver
American Brass Co., The, Waterbury, Conn.

TUBES—Stainless Steel
Bissett Steel Co., The, Cleveland.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ryerson, Jos., T., & Son, Inc., Chicago.
Steel & Tubes, Inc., Cleveland.

TUBING—Aluminum Seamless
Aluminum Co. of America, Pittsburgh.

TUBING—Flexible Metallic
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

TUBING—Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

TUBING—Nichrome
Steel & Tubes, Inc., Cleveland..

TUBING—Open Seam
Steel & Tubes, Inc., Cleveland.

TUBING—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Phila.

TUBING—Rubber
Goodrich, B. F., Co., The, Akron, Ohio.

TUBING—Seamless Steel
Bissett Steel Co., The, Cleveland.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ohio Seamless Tube Co., The, Shelby, Ohio.
Pittsburgh (Pa.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Steel & Tubes, Inc., Cleveland.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBING—Square and Rectangular
Steel & Tubes, Inc., Cleveland.

TUBING—Stainless Steel
Steel & Tubes, Inc., Cleveland.

TUBING—Tinned Brass or Copper
Bundy Tubing Co., Detroit, Mich.

TUBING—Tinned-Steel
Bundy Tubing Co., Detroit, Mich.

TUBING—Tool Steel
Bissett Steel Co., The, Cleveland.

TUBING—Welded Steel
American Welding & Mfg. Co., Warren Ohio.
Bundy Tubing Co., Detroit, Mich.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Ohio Seamless Tube Co., The, Shelby, Ohio.
Steel & Tubes, Inc., Cleveland.
Youngstown (Ohio) Sheet & Tube Co., The.

TUBULAR PRODUCTS
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Steel & Tubes, Inc., Cleveland.

TUMBLING BARRELS—See Barrels—Tumbling

TUNGSTEN METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

TUNGSTEN CARBIDE
Firth-Sterling Steel Co., McKeesport, Pa.

TURBINE-GENERATORS—Steam
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURNTABLES
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

TURNTABLES—Industrial
Canton Fdry. & Mch. Co., Cleveland.

TWIST DRILLS
Cleveland (Ohio) Twist Drill Co., The.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

TYPE—Steel
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

UNCOILERS—Processing
McKay Machine Co., The, Youngstown, Ohio.

UNIONS
Crane Co., Chicago.

VALVES—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
National Lead Co., 111 Bdway., N. Y. C.

VALVES—Air
Koppers Co., Western Gas Div., Fort Wayne, Ind.

VALVES—Air Blast for Presses
Littell, F. J., Mch. Co., Chicago.

VALVES—Air & Hydraulic Control
Galland-Henning Mfg. Co., Milwaukee.
Hanna Engineering Works, 1761 Elston Ave., Chicago.
Hannifin Mfg. Co., Chicago.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.
Tomkins-Johnson Co., The, Jackson, Mich.
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

VALVES—Butterfly
R-S Products Corporation, Phila., Pa.

VALVES—Gas, Water and Steam
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Wood, R. D., & Co., Philadelphia.

VALVES—Hydraulic
Baldwin-Southwark Corp., Southwark Div., Philadelphia.
Birdsboro (Pa.) Steel Foundry & Machine Co.
Crane Co., Chicago.
Galland-Henning Mfg. Co., Milwaukee.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Vickers, Inc., 1420 Oakman Blvd., Detroit.
Wood, R. D., & Co., Philadelphia.

VALVES—Pump, Rubber
Garlock Packing Co., The, Palmyra, N. Y.

VALVES—Solenoid
R-S Products Corporation, Phila., Pa.

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

VISES
Cincinnati (Ohio) Milling Mch. Co., The.
Jarecki Mfg. Co., Erie, Pa.

VISES—Machine
Hendey Machine Co., Torrington, Conn.

WASHERS—Bevel Steel
Nicetown Plate Washer Co., Inc., Philadelphia.

WASHERS—Iron or Steel
Nicetown Plate Washer Co., Inc., Philadelphia.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.

WASHERS—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

WASHERS—Lock
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massillon, Ohio.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.

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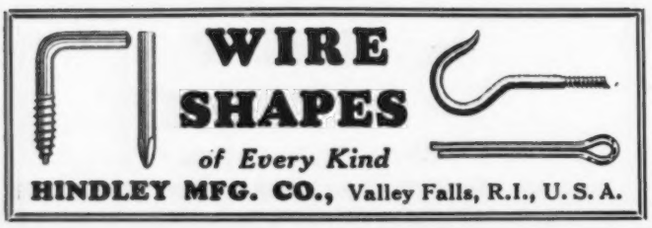

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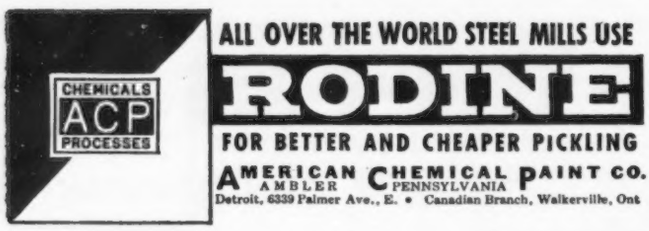

PRODUCTS INDEX

Positive Lock Washer Co., The, Newark, N. J.
Spring Washer Industry, 616 Wrigley Bldg., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WASHERS—Spring
American Nut & Bolt Fastener Co., Pittsburgh.
Beall Tool Co., East Alton, Ill.
Butcher & Harb Mfg. Co., Toledo, Ohio.
Eaton Mfg. Co., Massillon, Ohio.
National Lock Washer Co., The, Newark, N. J., and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Philadelphia, Pa.
Positive Lock Washer Co., The, Newark, N. J.
Spring Washer Industry, 616 Wrigley Bldg., Chicago, Ill.
Washburn Co., The, Worcester, Mass.

WATER SOFTENERS AND PURIFIERS
Scaife, Wm. B., & Sons Co., Ptgh.

WELDER CONTROL—For Spot, Butt & Projection Welding Machines
Electric Controller & Mfg. Co., The, Cleveland.

WELDING—Copper Hydrogen Electric
Bundy Tubing Co., Detroit, Mich.

WELDING—Electric
Federal Machine & Welder Co., Warren, Ohio.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING CONTACTORS
Clark Controller Co., The, Cleveland.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

WELDING FIXTURES
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

WELDING MACHINES—Butt
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Electric Arc
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING MACHINES—Electric Arc, Second-Hand. (See Clearing House Section)

WELDING MACHINES—Flash
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WELDING MACHINES—Press
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Seam
Federal Machine & Welder Co., Warren, Ohio.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WELDING MACHINES—Spot
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.
Thomson-Gibb Elec. Welding Co., Lynn, Mass.

WHEELS—Rolled Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Standard Steel Wks. Co., Burnham, Pa.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh.

WIRE—Barb
Pittsburgh (Pa.) Steel Co.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Phosphor Bronze Smelting Co., The, Phila.

WIRE—Flat, Round, Square or Special Shapes
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Insulated
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
General Electric Co., Schenectady, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Mattress
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Netting
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

WIRE—Special Drawn Shapes
Rathbone, A. B. & J., Palmer, Mass.

WIRE—Spring
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., The, Div. of Associated Spring Corp., Bristol, Conn.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Spring (Music)
Webb Wire Works, New Brunswick, N. J.

WIRE—Stainless Steel
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Webb Wire Works, New Brunswick, N. J.

WIRE—Steel
Bethlehem (Pa.) Steel Co.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Wickwire Brothers, Cortland, N. Y.

WIRE—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.
Pittsburgh (Pa.) Steel Co.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH
Buffalo (N. Y.) Wire Wks. Co., Inc.
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE DRAWING MACHINERY—See Wire Mill Mchry. & Equip.

WIRE FORMING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
U. S. Tool Co., Inc., Ampere, N. J.

WIRE MILL MACHINERY AND EQUIPMENT
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington (Conn.) Mfg. Co., The.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

WIRE PRODUCTS
American Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Wire Wks. Co., Inc.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hindley Mfg. Co., Valley Falls, R. I.
Pittsburgh (Pa.) Steel Co.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE ROPE
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Co.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Leschen, A., & Sons Rope Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., N. Y. C.

WIRE ROPE FITTINGS
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY—Automatic
Lewis Machine Co., The, Cleveland.
Shuster, F. B., Co., The, New Haven, Ct.

WRENCHES
Armstrong Bros. Tool Co., Chicago.
Billings & Spencer Co., Hartford, Conn.

WRENCHES—Pipe
Greenfield (Mass.) Tap & Die Corp.
Ridge Tool Co., Elyria, Ohio.

WRENCHES—Pneumatic
Ingersoll-Rand Co., 11 Broadway, N. Y. C.

ZINC—SLAB (Spelter)
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ZINC—Strip
Platt Bros. & Co., The, Waterbury, Conn.

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All Steel Frame. Some Late Models

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1600 lb. Billings & Spencer, Belt Driven
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5000 lb. Erie, All Steel, Triple "V" Slides, Belt Driven

HAMMERS—STEAM FORGING
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3500 lb. Niles-Bement-Pond Double Frame
3600 lb. Sellers Single Frame (Nearly New)
4000 lb. Chambersburg Single Frame
5000 lb. Niles-Bement-Po.d Double Frame
6000 lb. Niles-Bement-Pond Double Frame
8000 lb. Chambersburg Double Frame

HAMMERS—STEAM DROP
3000 lb. Chambersburg Double Frame
5000 lb. Chambersburg, Triple "V" Slides
5000 lb. Erie Screw Frame Adjustment
12,000 lb. Chambersburg Double Frame
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36" Electric Controller & Mfg. Co.

MILLING MACHINE—PLANER TYPE
48"x48"x11' N-B-P Extra Heavy Duty Type, Adjustable Rail. 4 Milling Heads, One Aux. Head for slab milling and boring

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No. 8 Wallace Pipe Bender, Arr. for Motor Drive. Capacity 1½" to 4"

PLANER
72"x72"x16' Niles-Bement-Pond Four Head, Heavy Duty, Motor Driven

PLANER—OPEN SIDE
60"x60"x26' Detrick & Harvey, Three Head, Motor Driven including 30 HP and 5 HP A.C. Motors. Power Feed. Air Cushion Table Return

PLATE EDGE PLANER
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No. 101 Production Mche. Co. Centerless Feed Polishing Machine in tandem. Capacity ¼" to 6" dia. Tubes

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Aetna Standard Gag Press, Arranged for Motor Drive. Capacity 2" to 6⅝" dia. tubes

PRESS—HYDRAULIC WHEEL
600 ton Niles-Bement-Pond, Arranged for Motor Drive. 48" Between Bars

BENDING ROLLS
14' WICKES PYRAMID TYPE, DROP END HOUSING, CAPACITY UP TO 1" THICK PLATE, TOP ROLL 20" DIA. BOTTOM ROLLS 14" DIA. DIRECT CONNECTED MOTOR DRIVE INCLUDING MOTOR AND STARTER. TOP ROLL ADJUSTABLE BY CLUTCHES TO PERMIT ROLLING OF CONES AND ODD SHAPES.

PRESSES—TOGGLE DRAWING

No. 2719 Hamilton,	27" Between Uprights
No. 15A Bliss,	40" Between Uprights
No. 168½ Toledo,	46" Between Uprights
No. 179 Toledo,	54" Between Uprights
No. 408 Bliss,	60" Between Uprights
No. 1018 Bliss,	60" Between Uprights
No. 408B Bliss,	84" Between Uprights
No. 412 Bliss,	86" Between Uprights

PUNCH & SHEAR COMBINATION
36" THROAT CLEVELAND SIZE EF. SINGLE END PUNCH, MOTOR DRIVEN. CAPACITY ¼" THRU 1"

PUNCH & COPING MACHINE
Cleveland Size IB, Motor Driven. 24" Throat. Capacity 30" I-beams

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20"x30" Single Stand Two High
20"x36" Two Stand Two High
Both complete with pinions, bed plates, motors, etc. Other sizes and capacities also available

ROLLS—PLATE STRAIGHTENING
62" Niles 7-Roll, Arranged for Belt or Motor Drive. Rolls 12" Diameter
50" Niles 7-Roll, Motor Driven. Rolls 8" dia.

SAW
No. 3 Ryerson High Speed, Motor Driven. 52" dia. Blade. Capacity 20"—65# Beams

SHEAR—GATE
68" Hilles & Jones, Motor Driven. Capacity ¾" Plate

SHEAR—SQUARING
96" Niagara Size 8-G, Belted Motor Drive. Capacity ⅝" Plate. Equipped with holddown, rear gage and front bracket

SHEAR—ROTARY
No. 6 Quickwork, Motor Driven. Capacity ¾" Plate. 48" Throat

SLITTER—GANG
34" Waterbury Farrel, Arranged for Motor Drive. Capacity No. 7 Gage

STRETCHER—HYDRAULIC
30 ton Southwark Hydraulic Stretcher for bars, tubes, strips. Capacity ⅜"x6" strips or equivalent in other shapes. Complete with pump and motor

STRAIGHTENERS
⅝" Shuster Rotary Straightener and Cut-off Machine, Motor Driven. 20' cut-off
No. A1 Shuster Roll Straightener and Cut-off Machine, Direct Motor Drive. Capacity 1", Cut-off 12'
No. A2 Shuster Roll Straightener and Cut-off Machine, Direct Motor Drive. Capacity ¾", Cut-off 12'
No. 1 Sutton Round Straightener, Motor Driven. Capacity ⅜" to 1½" dia. Bars, ⅜" to 2" dia. Tubes

TESTING MACHINES
30,000, 50,000, 100,000, 600,000# Olsen & Riehle Universal Belt and Motor Drive
20,000, 50,000# Olsen & Riehle Compression
60,000# Riehle, Torsion Testing, Belt Drive
100,000# Olsen Spring Testing Machine, Motor Dr.
400,000, 600,000# Olsen Chain Testing

WIRE DRAWING MACHINES
Morgan Double Drum Wire Drawing Block, Motor Driven. Capacity ⅝" dia. Wire

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5" bar Niles-Bement-Pond Floor type
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No. 2 Rochester, 3" bar
No. 3-A Universal, 3" bar
No. 1 Cleveland, 2½" bar

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No. 1-A Pratt & Whitney Jig Borer
24", 36", 42" Bullard "New Era"
30", 52", 62", 72" King
42", 48", 54", 60" Colburn

DRILLS
1, 2, 3, 4, 6-spindle Leland-Gifford
1, 2, 3, 4, 6, 8-spindle Henry & Wright
No. 2 Colburn, 1, 2, 3, 4 Spindle
No. 4 Colburn, 2 Spindle
No. D-4 Colburn Heavy Duty
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18" Gleason Tester & Lapper, Motor Drive
12"x72" G. & E. Auto. Rack Cutter

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No. 4—12"x66" Landis Universal
No. 70—Heald Internal
No. 10—16" Blanchard Vert. Surf., M.D.
No. 16-A Blanchard Automatic Surface, M.D.

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No. 2-B, No. 3-B Milwaukee Pl., motor in base
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No. 4 Cincinnati Plain
No. 1½, No. 2 Brown & Sharpe Universal
No. 2, No. 3 Cincinnati H.P. Vertical
No. 5-B, No. 6, No. C2 Becker Vertical
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24" Cincinnati Auto. Simplex
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A Happy and prosperous New Year to the users of the classified sections.

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Procurement Division, Public Buildings Branch, Washington, D. C., Dec. 9, 1938.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Jan. 10, 1939, for construction of the U.S.P.O. at New London, Ohio. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $5 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished, in the discretion of the Assistant Director, to builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. Reynolds, Assistant Director of Procurement, Public Buildings Branch.

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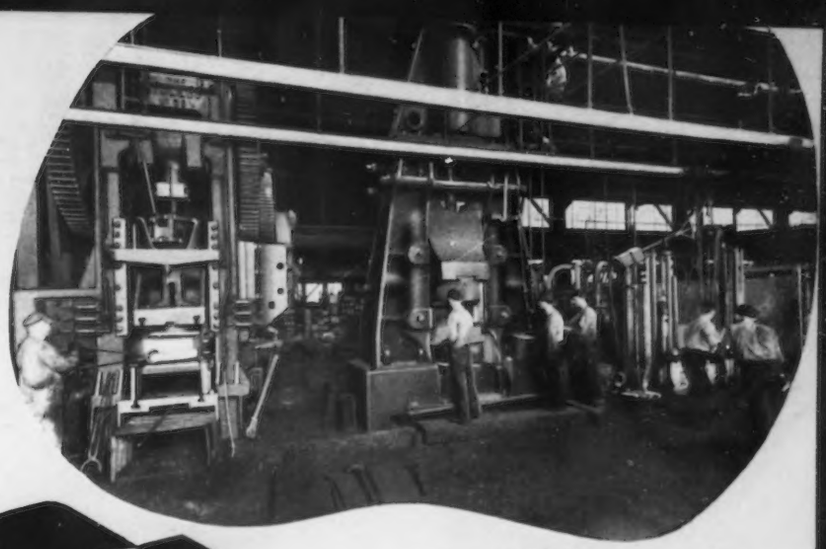

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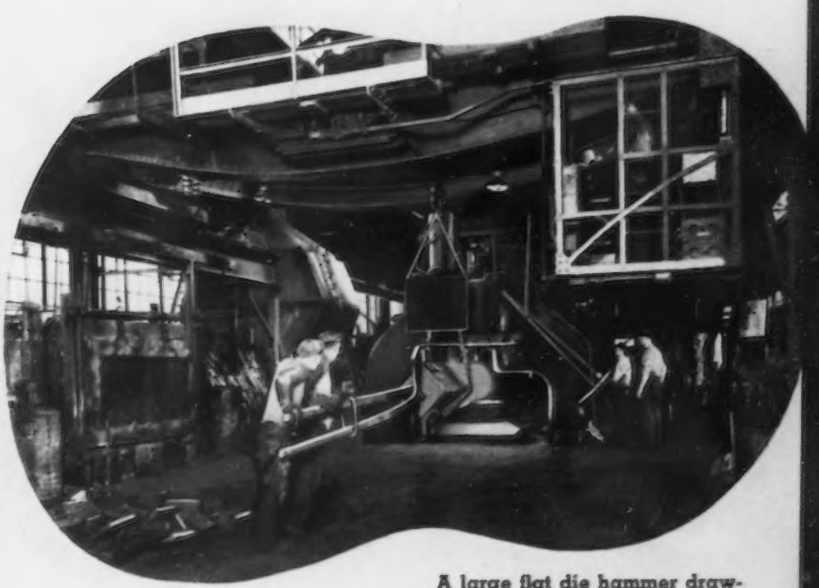

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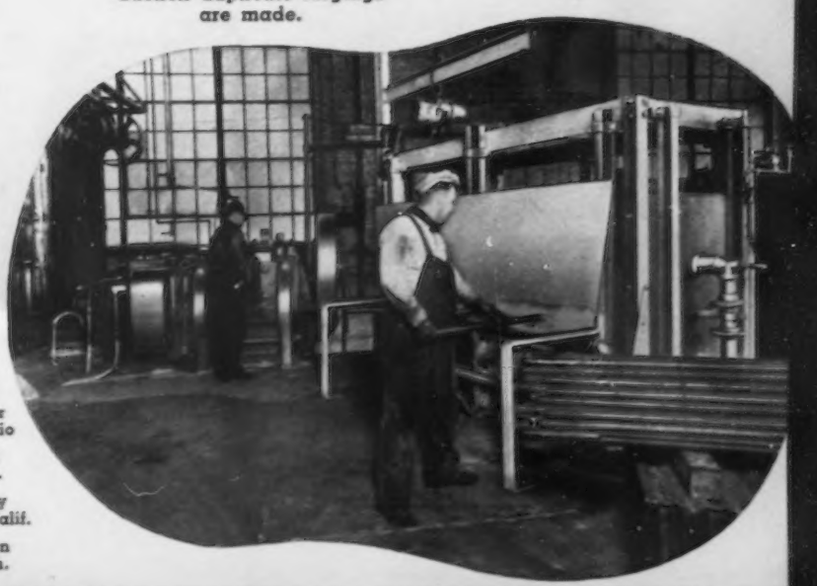
A corner in the Upset Forging Department where high production duplicate forgings are made.



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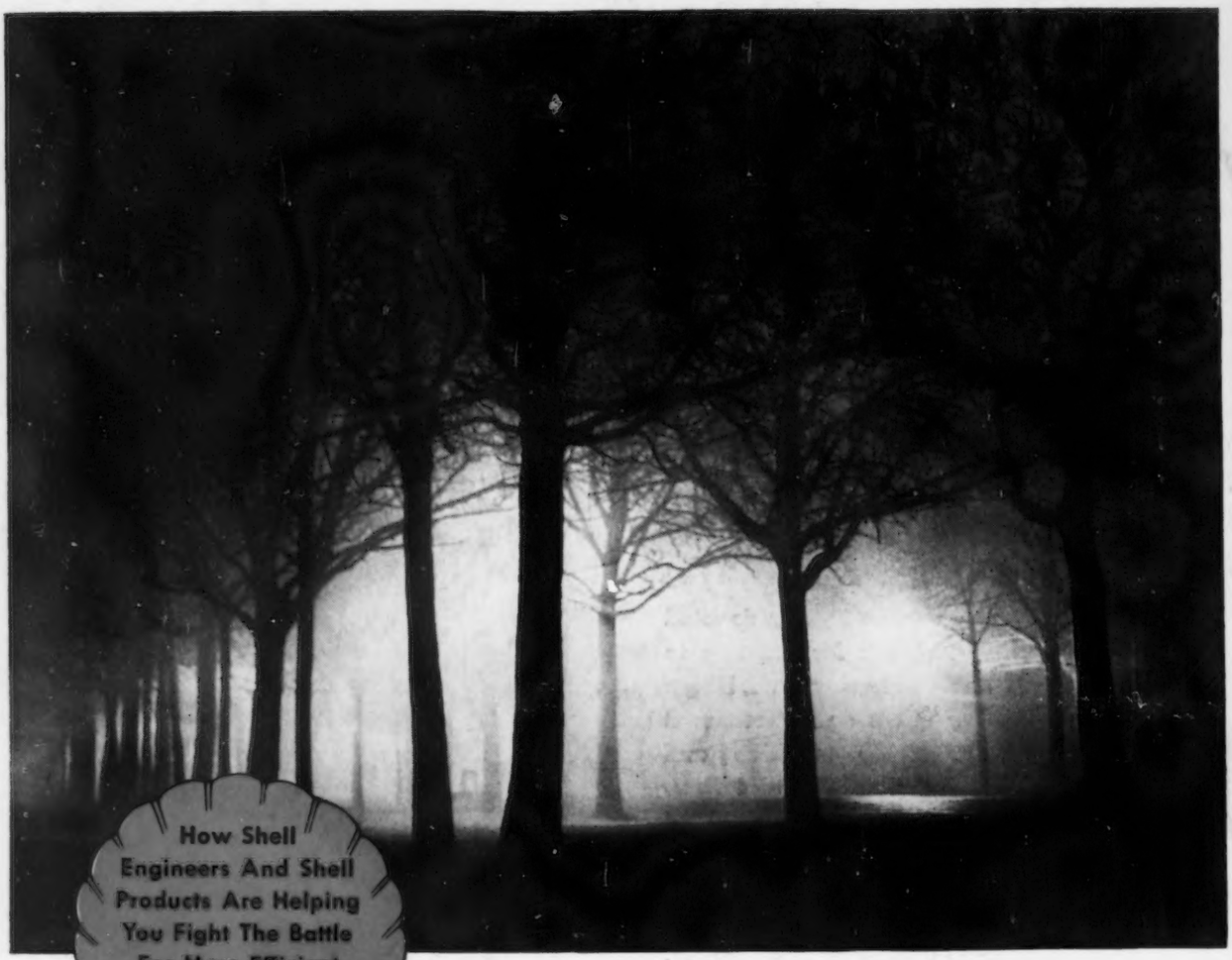

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